Engineering Library

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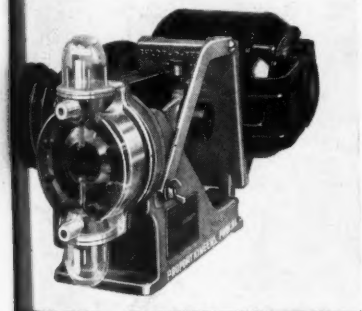
ENGINEERING — CONSTRUCTION
MAINTENANCE — OPERATION

WHAT IS YOUR CHEMICAL FEEDING PROBLEM

FOR PUMPED WATER SYSTEMS
CONSTANT RATE FEEDERS
MANUAL ADJUSTMENT



1.—Heavy Duty Midget Chlor-O-Feeder

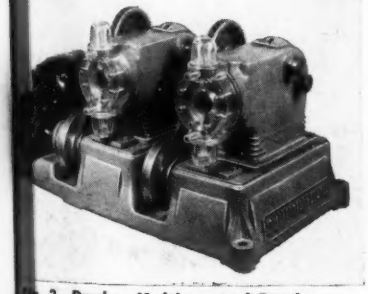


Fig. 2.—Duplex Multi-control Feeder

Fig. 3.—Triplex Multi-control Feeder

Whether your water system is pumped or gravity flow, low or high pressure, %Proportioneers, Inc.% is prepared to furnish you with equipment and service on all your Chemical Feeding (chlorination, ammoniation, calgon, soda ash, lime, alum, etc.) and Proportioning Problems. You are obligated in no way if you send for bulletin information, engineering recommendations, or quotations from

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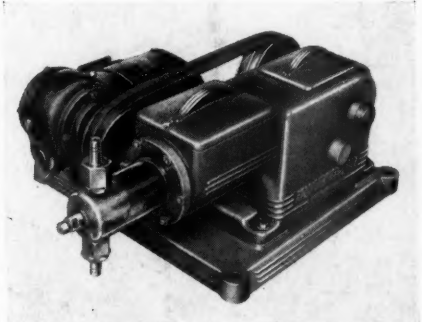

Fig. 4.—High Pressure Midget Chem-O-Feeder

FOR GRAVITY FLOW SYSTE
FLOW PROPORTIONAL FEED
AUTOMATIC ADJUSTMENT

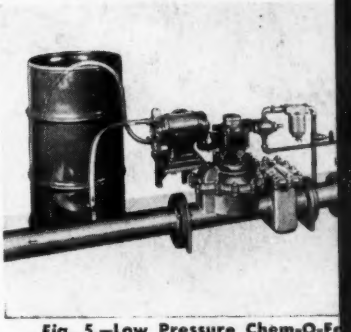

Fig. 5.—Low Pressure Chem-O-F

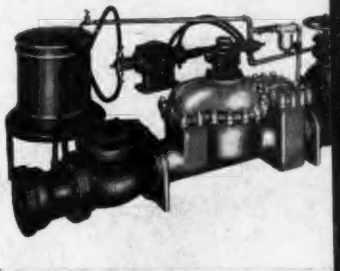

Fig. 6.—High Pressure Chem-O-F

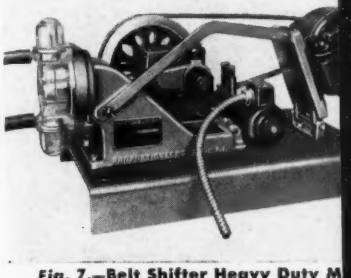

Fig. 7.—Belt Shifter Heavy Duty M
Chlor-O-Feeder

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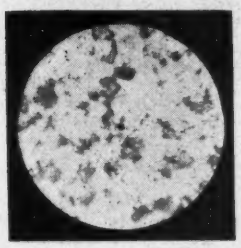
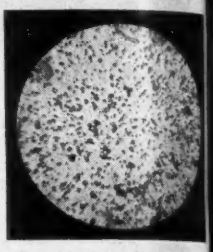
Errol Williamson
Vice President.

HOW CEMENT DISPERSION WORKS



Cement suspended in water
UNDISPERSED
WITHOUT POZZOLITH

In a normal concrete mix, cement particles tend to bunch together, thereby (1) limiting hydration and (2) trapping water within the cement clumps. (See photomicrograph above)



Cement suspended in water
DISPERSED
WITH POZZOLITH

Cement Dispersion drives these particles apart and (1) exposes their entire surface area to hydration, at the same time (2) making the water entrapped in the clumps available for lubrication of the mix. (See photomicrograph above).

Find out how Cement Dispersion produces greater speed, workability, placeability, watertightness and durability and reduces costs. Send for copy of illustrated Pozzolith booklet today.

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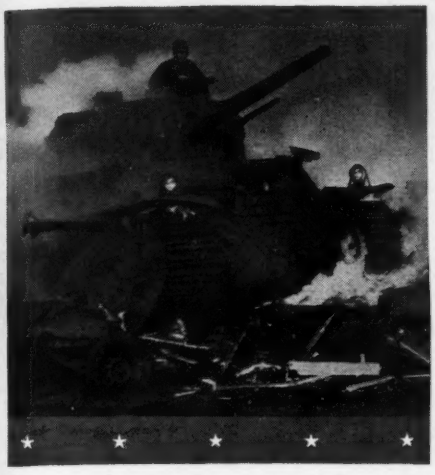

(PHOTO BY U. S. ARMY SIGNAL CORPS)

Old, familiar friends have taken new shapes and gone to war. Now ARMCO Tunnel Liner Plates can be purchased only for the most vital war-time projects.

Where metal tunnel liner *must* be used, ARMCO Plates are doing their part and more. They save precious metal because gage for gage this heavy duty liner is stronger (section modulus) than any other plate. Less metal is required to do the work. When completed rings can be spaced to take advantage of partly self-supporting ground, fewer plates may actually be used. Work moves fast; for one man can handle and assemble the light sections with structural wrenches.

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PUBLIC WORKS

Founded in 1896

Devoted to the interests of the engineers and technical officials of cities, counties and states

Vol. 74 No. 2

A. PRESCOTT FOLWELL, Editor

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WARS CAN'T WAIT ON WEATHER!

THAT'S why construction of factory buildings, airport runways, or concrete gun emplacements must continue through cold weather.

True, concrete hardening slows up as temperatures drop, but you can compensate for this natural slowness by adding calcium chloride to portland cement concrete. Engineers recognize this value and specify calcium chloride for speed and safety in concrete construction.

Reports of tests made at the National Bureau of Standards and other data, practical methods, etc., are contained in the new manual, "Early Strength Concrete." Write now for Bulletin 28 to the Calcium Chloride Association, 4145 Penobscot Building, Detroit, Michigan.

When writing, we will appreciate your mentioning PUBLIC WORKS

THE WAR EMERGENCY

Scarcity of Sanitary Engineers

Chairman Paul V. McNutt of the War Manpower Commission on January 18 took steps to provide for the more effective distribution of sanitary engineers among the Army, Navy, Public Health Services and state and municipal agencies. So great have been the war demands for these technically trained men that a national shortage is now threatened. Two hundred are needed for the U. S. Public Health Service alone.

To locate and assign such personnel to the various war services, Mr. McNutt established a committee with Abel Wolman as chairman, and including also Kenneth D. Maxcy, Harold E. Babbitt, F. C. Bishopp, V. M. Ehlers, Gordon M. Fair, H. A. Whittaker, and J. K. Hoskins.

There probably are not many more than 1,000 sanitary engineers in the entire country not already in some service directly or indirectly related to the war. The Public Health Service has lost some of its sanitary engineers to the armed forces and has in turn greatly depleted state and municipal health departments of about 50% of their forces.

Availability of Waterworks Chemicals

The WPB said on January 8th, "Recent statements quoted in the press have conveyed the impression that the supply of copper is adequate to meet all military and essential civilian requirements.

"Widespread acceptance of such statements would constitute a threat to our entire war production program. The supply of copper is not adequate and never will be while this war is on."

A few weeks ago Henry L. Dahm said that waterworks operators would probably find no difficulty in obtaining chlorine, but there might be delay because of scarcity of cylinders, and because of ODT regulations relative to less-than-carload shipments, speed limits for trucks, and others. That HTH and Perchloron are demanded in large quantities for Army and Navy use. At present the small quantities used by waterworks probably can be obtained; but if not, they can make their own sodium hypochlorite solution by passing chlorine gas into a caustic soda solution. That, while ferric sulphate is not on direct allocation, certain defense plants are using such large quantities that at present a rating better than A-2 is necessary to obtain it.

There is temporarily an acute shortage of ammonia, but probably no water works plant has been denied it by the WPB. The same is true of copper sulphate. There appears to be no scarcity of activated carbon.

No Shortage of Creosote

There is no shortage of creosote, many rumors to the contrary. "For many months before the outbreak of the war, creosote was used extensively for defense and other Government construction. It is now being used in much greater quantities. It is not a critical material and it is available in sufficient quantity to fill all needs. Its production in the past year has been greatly increased, and will be further increased after completion of new construction now under way for producing large quantities of coal tar to be distilled to obtain the tar acids so urgently needed in the manufacture of ordnance. Since creosote is a by-product of this distillation, a plentiful supply is assured." *Wood Preserving News*, January, 1943.

Procedure Under Priorities Regulation No. 3 Simplified

Under an amendment to Priorities Regulation No. 3, which was announced December 28th, those who must place rush orders for scarce materials by telegraph need only state in the telegram "Ratings indicated are certified pursuant to Priorities Regulation No. 3," and the copy of the telegraphic order retained by the sender be signed or authorized in the manner set forth in Priorities Regulation No. 7. If the order is by telephone, requiring shipment within seven days, an authorized official may apply or extend a preference rating to which he is entitled by stating, in telephoning the order, that the rating is certified pursuant to the regulations, and furnishing within the seven days a written confirmation of such preference rating.

Emergency Specifications for Traffic Paint

Emergency Alternate Specifications for Paint: Traffic, Exterior, White and Yellow, E-TT-P-115, have been issued by the National Bureau of Standards for the purpose of standardizing a satisfactory quality of paints made from the natural resins recently made available for this purpose. Until the amendment to WPB Order M-56, restrictions on both natural and synthetic resins had reduced the properties of the paints to the point where undue waste of pigments was being encountered.

Paint for traffic markings and other similar purposes is essential to proper movement of traffic. When the use of the two natural resins, batu gum and congo copal gum was restricted by M-56, considerable ingenuity was shown by paint manufacturers in providing substitutes. Subsequently, the supply of these two resins became easier, so an amendment was issued permitting the use of one pound or less of batu gum, or two pounds of congo copal gum, or both, per gallon of paint.

Copies of the specifications may be obtained from the National Bureau of Standards, Washington, D. C., or from the Protective Coatings and Materials Section, Chemicals Branch, War Production Board, Railroad Retirement Building, Washington, D. C.

Priorities Change Highway Design

New Jersey State Highway Department has announced that priorities on bridge and road construction materials have forced revision of completed plans and make necessary virtually new designs embodying the use of timber as a substitute for steel in bridge construction. The thickness of concrete has been increased in roads where metal reinforcing rods cannot be obtained.

You Wouldn't Use

A RAKE TO SWEEP THE FLOOR

THE prongs of a rake are strong enough to remove dirt from a floor but since they do not cover as much surface as the bristles of a broom their strength is wasted.

In the same manner, a carbon small in particle size and light in weight presents immeasurably more effective surface for removing tastes and odors in raw water supplies.

Aqua Nuchar Activated Carbon actually offers billions of particles for sweeping up taste and odor bodies present in water. In a recent test by Roy M. Allen, prominent microscopist of Bloomfield, N. J., a regular commercial grade of Aqua Nuchar Activated Carbon was found to contain *120 billion* particles per gram.

This microscopic fineness with the resultant increased porosity and superior dispersion and suspendability, explains Aqua Nuchar's amazing ability to remove tastes and odors.

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When you need special information—consult the classified READER'S SERVICE DEPT., *pages 55-57*

PUBLIC WORKS Magazine . . . FEBRUARY, 1943

VOL. 74. NO. 2

Overcoming a Bloodworm (Chironomid) Problem

By J. C. RICKARDS
Water Superintendent, Canton, N. C.

J. C. Rickards

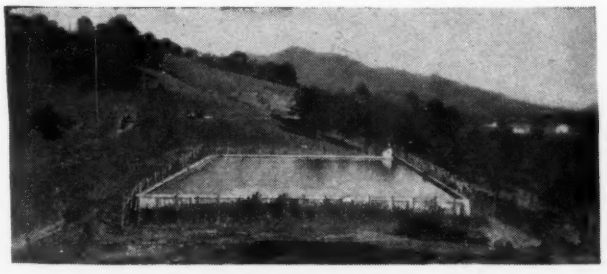
Canton, N. C., got rid of bloodworms in one of its two reservoirs by draining and washing the walls with copper sulphate and calcium hypochlorite.

CHIRONOMID midges (commonly known in the larva stage as blood worms) sometimes create a difficult problem for the waterworks man when his water supply is stored in open reservoirs. The midges deposit their eggs in still, open bodies of water, and if that still, open body of water happens to be a reservoir of city drinking water, the water superintendent must work quickly if he wishes to prevent ill feeling and just criticism of the consumers when they find small red worms in their lemonade and ice cubes. From the health standpoint, the problem of blood worms is largely a psychological one, as the water in which they are found may be found to pass rigid chemical and bacteriological standards.

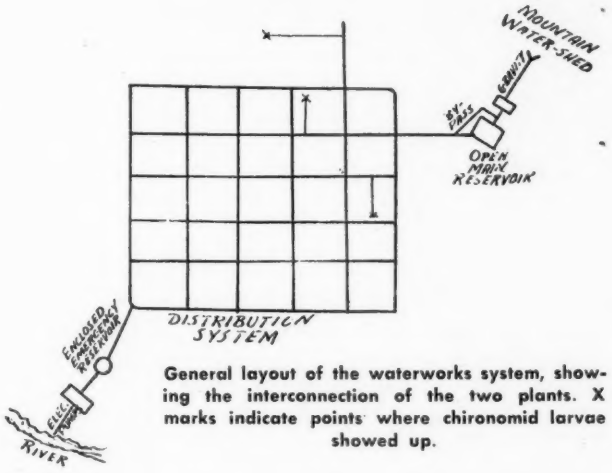
This is a report on methods used to get rid of the chironomid after its development into the larva stage in one of the reservoirs of Canton, North Carolina.

When on the morning of July 16, during some of the summer's hottest weather, the Canton Water Department received a call that something was wrong with the water, it was natural to assume that the report was erroneous, since the daily analysis had just been checked and showed color 0, odor 0, taste 0, turbidity 0, pH 7.2, bacteria count 0. However, when two hours later a second call was received in which the consumer reported small angle worms in the water, although it sounded queer, the complaint was investigated.

A checkup failed to reveal any of the so-called angle worms, although the woman who called was very definite about having found three baby red worms in her wash water. The next morning a call was received from a large industrial plant here, to which the city supplies drinking water, stating that several larvae which looked like mosquito wigglers had been found in the water cooler. Then there was no getting around the fact that something *was* wrong.



Canton's 750,000-gallon main reservoir.



General layout of the waterworks system, showing the interconnection of the two plants. X marks indicate points where chironomid larvae showed up.

The last caller had strained out the organisms to support his story. Upon examination, they seemed to be very small worms. We were advised by those who had found the organisms in the water to clean out the water lines; however, it was realized that steps must be taken to arrive at the source of the trouble if is was to be eliminated.

After some contemplation it was remembered that, in replacing a stand pipe in the main reservoir about two days before, a slight sediment had been stirred up. Although this had seemed of little significance at the time, it seemed advisable to make an immediate investigation. The main reservoir is an open one (whereas the emergency reservoir is closed), therefore is in greater danger of pollution.

By the use of a sampling cup on a long stick, samples of sediment were obtained from the bottom

Equipment used to sterilize reservoir, including hose, broom and spray machine.

of the reservoir, and several of these samples were found to contain a small wriggling worm, which proved, upon investigation, to be a species of chironomid. What literature could be found on combating this organism was impractical. The storage supply here is too small to allow for sufficient retention time, and it was wished, if possible, to overcome the problem without having to use the emergency pumping plant.

At this point it might be interesting to give a description of the city's water system. The Town of Canton has two water systems. One is of the gravity type with pressure filters and an open reservoir with a capacity of 750,000 gallons. The water comes from a protected mountain water shed and in normal seasons will furnish the town with its full demand of water—about 550,000 gallons per day.

The other plant, which is used during dry seasons and in cases of emergency, is a modern rapid sand filter type, of 2,000,000 g.p.d. capacity. The water from this plant is pumped into a 500,000-gallon covered, circular reservoir at a cost of operation about ten times as great as the gravity system. The two reservoirs are about three miles apart on opposite sides of town and are connected together through the town mains, the emergency reservoir being six feet higher in altitude than the main reservoir so as to provide enough pressure to keep the main reservoir full when it is necessary to pump.

At the time the blood worm problem arose, the emergency reservoir contained only about 300,000 gallons. It was obvious that the infected reservoir must be drained, so its supply to town was immediately cut off and the water from the treatment plant by-passed directly to the town. Since it would have created a hazard to drain the reservoir immediately, it was held in storage for two days and the flow through the treatment plant increased 50,000 gallons a day above the demand. Thus, the water not consumed by the town was forced through to the emergency reservoir, bringing the total supply of water in this reservoir to 400,000 gallons on the day the main reservoir was drained.

During this time the mains in which the presence of the larvae had been reported were flushed with a strong solution of calcium hypochlorite. There were only three of these lines (each in a different section of town) each a long three-quarter inch dead-end line. A washout was installed at the end of each line and cloth strainers attached. Consumers were notified not to use the water until the flushing was completed.

(However, one customer disregarded or forgot this order and called to state that the chlorine was so strong in the water this morning that no one could possibly drink it!)

When the lines were flushed with the sterilizing solution many blood worms were deposited on the strainers which had been attached to the washout; however, not all of them had been killed. This surprising fact proved that the blood worm is highly resistant to chlorine. (The water all over town had shown about one-tenth of a part per million of residual chlorine at the time the blood worms were reported.) The lines were flushed until no deposits showed on the cloth strainers.

In the meantime water from fire hydrants in various sections of town failed to show a single organism and no others were reported by private consumers.

On July 20 the reservoir was drained. The men who were to do the cleaning examined the patches of sediment on the bottom of the reservoir and reported it to be nothing but mud. On closer examination it was found that the patches of mud could be separated into countless individual capsules, each about three-quarters of an inch long and about one-eighth of an inch thick, which, when rubbed between the fingers, broke up to show a chironomid in its larva stage, a red worm about one quarter of an inch long and one thirty-second of an inch in thickness. Eggs were found deposited in patches on the walls of the reservoir, but were thickest on the exposed iron surfaces of pipe and wall bracers.

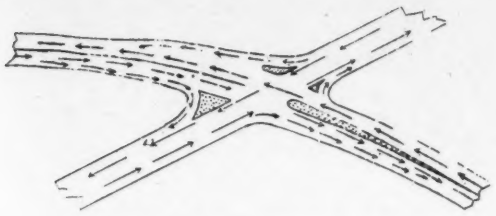
The sides and bottom of the reservoir were thoroughly scrubbed and washed with a strong stream from a fire hose, and then washed and sprayed with a strong solution of copper sulphate and lime, 50 pounds of copper sulphate and 25 pounds of lime being used for this process.

For the next two days the reservoir was allowed to stand empty, exposed to bright sunlight. The next step was to spray the sides and bottom with a solution of calcium hypochlorite of 10 grams per litre strength. Four hours after this treatment the reservoir was washed again with the fire hose and was ready to be put back into service. The walls were still blue from the copper sulphate treatment. The reservoir outlet was first opened, which allowed a gradual shift from the emergency reservoir into the main reservoir until an equilibrium was established. This built up about 300,000 gallons over night (enough to restore the reservoir to service) so the by-pass was closed and the gravity supply was turned back into the reservoir.

The results of this treatment were quite satisfactory. The reservoir was empty only four days. The emergency plant was not operated. No hazards were created. Little extra cost was involved above treating 50,000 gallons per day of extra water until the reservoir was filled. Incidentally, the promptness with

The new emergency waterworks plant.

(Continued on page 38)



Panhandle Boulevard.

California Project Involves Novel Intersectional Design

By ASA G. LINDLEY

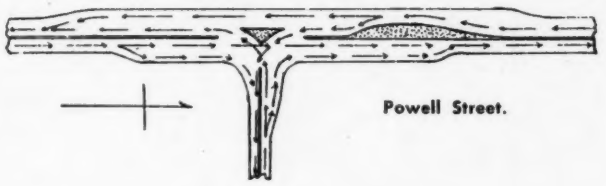
Handling heavy intersectional traffic by use of channelization structures combined with a system of traffic-actuated signals.

HOW to handle heavy intersectional traffic without building expensive, vital material-consuming structures was a problem which the California Division of Highways found it necessary to solve. The problem was very real: how to provide ingress at four points to the heavily traveled East Shore Highway connecting the shipyards of Richmond with Oakland and San Francisco-Oakland Bay Bridge points. Traffic had spiralled in recent months due to the tremendous increase of shipyard employees, plus other traffic to the war industries of the industrial sections of Oakland and Emeryville.

East Shore Highway was constructed in 1939 to provide a high-speed, limited-access route from the Bay Bridge to U. S. 40 and intervening points. It is the principal inland route to northern California, Oregon and Washington, and hence carried a great amount of both commercial and pleasure traffic.

As originally constructed, East Shore Highway followed standard California design, with a physical divisional strip, two 21-foot lanes and 12-foot oil-treated shoulders.

Traffic studies revealed four principal bottlenecks in the flow of traffic. The first was where Powell Street, Emeryville, intersected. The second bad intersection was at Ashby Avenue, Berkeley, which was a feeder to both industrial and residential areas. Third troublesome point occurred at University Avenue in Berkeley, where a fairly heavy volume of traffic from downtown Berkeley passed over a viaduct and onto East Shore through signals. The intersection of Panhandle Boulevard, in Richmond, provided the fourth bottleneck. Here the angle at which the two routes crossed caused



Powell Street.

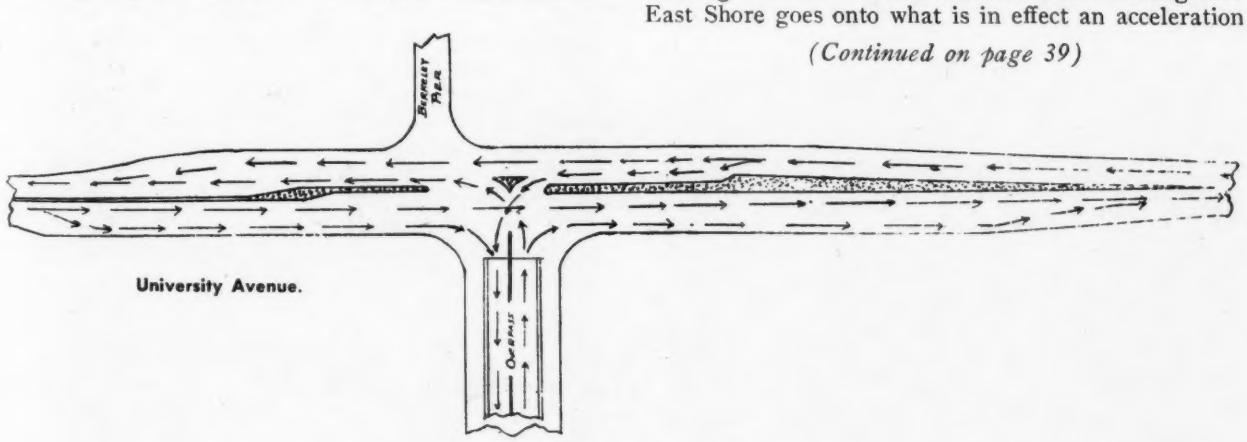
long intersectional areas and many possible points of collision.

The solution was found in design of rather unique channelization structures, in conjunction with a system of traffic-actuated signals. In general, the theory of the design is to allow south- and north-bound vehicles from and to the Richmond shipyards to proceed through uninterrupted and without danger of collision with out- and in-coming traffic. Acceleration and deceleration lanes, plus hog-back shaped islands to squeeze traffic into the proper lanes, and the conventional directional islands have all been employed.

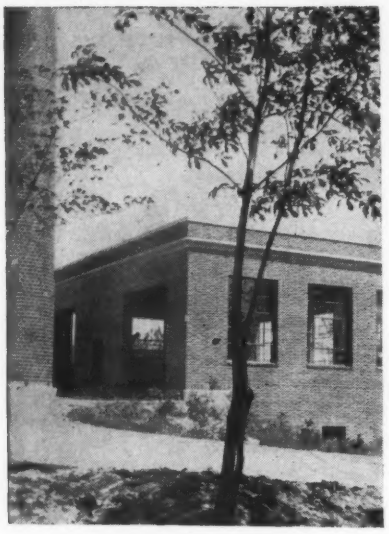
The Powell Street design is typical. Both north- and south-bound lanes have been widened. South-bound traffic is squeezed into the high-speed, or right, lane by the 400-foot long hog-back island. Then traffic desiring to make a left turn onto Powell Street may do so in safety by cutting back to the left lane in the shelter of the island's terminus. This provides for a bank of vehicles which may be halted awaiting the signal to turn. They are, of course, entirely out of the way of the main traffic stream.

North-bound traffic desiring to pass onto Powell Street drops onto the 300-foot deceleration lane and then right turns. Powell Street traffic left turning onto East Shore goes onto what is in effect an acceleration

(Continued on page 39)



University Avenue.



View of front of incinerator.

Eight Years' Operatio P

By I. RUSSELL RIKER, C. E.
Engineer and Director, Dept. of Engineering, Princeton, New Jersey

IN THE fall of 1934 the borough of Princeton, N. J., placed in operation a new incinerator, which was one of the first projects to be constructed under the Federal Public Works Administration and also one of the first municipal garbage incinerators to be constructed at a sewage treatment plant. This handles the refuse of Princeton Borough, Township and University, with a total population of approximately 15,000.

Incineration of municipal garbage was nothing new in Princeton, for in 1925 the borough had constructed an incinerator, but the location later became objectionable and it was entirely inadequate, both the furnace and chimney failing after eight years of operation. The experience gained in the construction and operation of the old incinerator was valuable when it came necessary to construct a new one. There was nothing particularly new in the design of the new incinerator, but the capacities of the building, the furnace, and the chimney were made much larger, and everything that was possible was made elastic, and in duplicate. Now, after eight years of operation (which incidently was the life of the original incinerator), the building and furnaces of the present incinerator show very little depreciation, and the continued low operation cost justifies the design and the location. The incinerator is under the technical supervision of the sewage plant operator, which is in itself a great step toward reducing the cost of operation. Where a municipality has a sewage plant site within reasonable distance, it should without question locate its municipal incinerator there. We have burned sludge in our incinerator with good success, although this has not been the usual method of sludge disposal, due to the fact that we have a large acreage for plowing the sludge under.

Description of Plant

The incinerator plant consists of two furnaces, each designed to burn one ton per hour, or 16 tons with both furnaces operating 8 hrs. a day. It has burned a maximum of 25 tons in 8 hr. It is housed in a two-story building 35′ x 50′, with two 12′ x 12′ metal doors opening onto the charging floor. An 80-foot chimney is located outside and between the doors, having a first-class fire brick lining, bound for the full height with steel lattice, with an air space between the lining and outside brick. The second or charging floor has two charging holes, each leading to a separate furnace on the floor below. There is a wash room and toilet located on the charging floor. On the first floor are

Tin cans in the incinerator.

located two circular furnaces, ten feet in diameter, incased in a steel jacket. Each furnace has it's own combustion chamber containing a number of baffles, with a common flue leading to the chimney and a preheater between them, a forced draught fan forcing cold air down around the preheater tubes beneath the grates. The building is constructed of common brick, laid with Flemish bond. It has a flat roof, laid on a concrete slab.

Method of Financing and Operation

The total cost of the plant, including the PWA grant, was $36,908. The municipality borrowed $24,000 by issuing 4% bonds to the PWA, $2,000 of which were to be paid off each year. Now after eight years of operation there is outstanding $8,000 in bonds. (It is interesting to know that the PWA made a considerable profit on the resale of the bonds.) The carrying charge for next year will be $320 interest, and $2,000 amortization. The total annual cost is proportioned between the three parties that use the plant—borough, township and university—according to the amount of refuse delivered by each party. All refuse is weighed at the plant by a platform scale, and a careful daily record is kept.

Two men operate the plant. It was formerly opened for operation from 5 to 6 in the morning, but recently the hours of operation are between 8 A.M. and 3 P.M., although the operator may stay an hour and a half later to clean up the day's work. The remainder of the operating cost consists of a small amount for power and water, and the annual repairs, which consist principally of shutting down the incinerator during slack

# of Princeton's Incinerator

Two, 8-ton furnaces burn garbage and rubbish from 15,000 population. Details of operation and cost. Salvaging of rubbish.

periods and going over the furnaces thoroughly. It has been necessary to build up a part of the interior of the furnaces each year, using Plibricko. We formerly did the work ourselves, but now a contract for approximately $350 a year is given to a private contractor. No fuel other than refuse has been used in the operation of the incinerator since it was started. The table shows total tons of garbage and rubbish burned in the incinerator for each month in the year 1941, and the total for the years 1941, back to 1934. The maximum quantity of refuse burned was in 1939; the minimum in 1935, a difference of nearly 500 tons. The operating cost per ton in 1941 was seventy-eight cents, while the carrying charge was fifty-one, bringing it to a total cost of $1.29.

Quantity and Quality

In determining the efficiency of the incinerator, some idea should be had as to the character of the waste, and how and when it arrives at the incinerator. The following gives some idea as to the quantity collected from various sources. Garbage is 68% of the total.

Breakdown of Refuse for 1936

	Total Quantity Tons	*Percentage*
Total garbage by borough collector	961	39%
Total garbage from borough by private collector	615	25%
Total garbage from individuals	120	5%
Total garbage from township	274	11%
Total garbage from university	494	20%
Total garbage	2464	
Total rubbish from borough by private collectors	411	36%
Total rubbish from individuals	177	16%
Total rubbish from township	212	19%
Total rubbish from university	330	29%
	1130	32%
	2464	68%
Total refuse	3594	

The Borough collector, a contractor, collects the garbage in a modern garbage truck, six days a week, each household being collected three times a week. The regulations governing the collection are as follows:

All garbage and food cans are to be placed by the occupants of the premises at the rear door. Tin cans, other than food cans, bottles and refuse shall be placed by the occupants of the premises on the street curb.

All wet garbage shall have liquid drained off and be wrapped in paper or other combustible material before it is placed in a water tight garbage can, thus preventing odor and breeding of flies in the summer and freezing and adhesion to the can in winter. Also all "Food Cans" shall either be wrapped with the garbage or wrapped separately. "Food Cans" are hereby defined to mean any can which has, prior to its being removed, been used for storage of food.

GARBAGE NOT PREPARED IN THIS MANNER WILL BE REFUSED BY THE COLLECTOR.

The municipal collectors make two (sometimes three) trips a day to the incinerator, one beginning at eight, the second around eleven. The private collectors, collecting from stores and private individuals who cannot or do not care to wrap their garbage, deliver over twenty times a day, without the regulations. Their refuse is about 60% garbage, and 40% rubbish. Garbage from individuals who carry it themselves is hardly ever wrapped. The Township garbage is prepared the same as the Borough, and usually arrives in early afternoon. By far the worst of all is the University garbage, which has a moisture content from eighty-five to ninety percent, while that of the Borough is sixty-five to seventy. The University makes up for this, however, by large quantity of combustible material which they deliver to the incinerator. This combustible material consists of paper from classrooms and is usually put in the bin and added to the fire as needed. A real hot fire must be secured when garbage with high moisture content is added.

The average daily tonnage is about twelve tons, with a maximum of twenty-five tons. We have usually been able to take care of our maximum tonnage with the

Incinerator partially concealed by foliage.

REPORT ON PRINCETON INCINERATOR FOR THE YEAR 1941

Month	*Total No. of Tons Burned*	*From the University*	*From the Borough*	*From the Township*	*Tons ash residue from furnace*	*Operation Cost*	*Operation Cost Per Ton*
January	365	104	201	59	37	$222.82	$.61
February	359	107	192	59	36	261.42	.72
March	390	114	215	61	39	232.61	.60
April	415	122	225	68	42	219.62	.53
May	430	120	249	61	43	221.65	.51
June	388	94	243	51	39	300.28	.77
July	309	35	215	59	31	262.07	.84
August	277	22	201	54	28	551.68	1.99
September	362	75	230	58	36	298.72	.82
October	435	131	232	71	44	232.97	.53
November	381	110	214	57	38	220.97	.58
December	364	85	219	60	36	454.03	1.24
1941—Totals	4474	1120	2638	716	449	3478.84	.78
1940—Totals	4351	1133	2525	691	434	3423.89	.78
1939—Totals	4563	1223	2827	511	458	3163.80	.69
1938—Totals	4521	1234	2709	579	451	3240.03	.71
1937—Totals	4098	1064	2615	420	427	3131.84	.76
1936—Totals	3632	818	2391	4235	360	2899.41	.79
1935—Totals	3594	824	2284	486	355	2900.00	.79

Average operating cost .77 per ton. Fixed capital cost 82c per ton. Cost per capita in 1942, 39c.

use of only one furnace, the empty furnace being filled with dry material, ready for the morning garbage. Tin cans are allowed in the incinerator; in fact, they help the burning if too many do not accumulate in one spot. Bottles are kept out of the incinerator. Sewage plant screenings are burned daily. A hot water boiler was originally installed to be fired by hot gases from the incinerator, but this has not been found practical. A pyrometer indicating temperature of the combustion chamber gives a continuous record and is an excellent check on the operation. If the temperature is kept above 1,000 degrees, we are sure of good combustion. Sludge could be burned in the incinerator, but we have other more economical means of disposal, as stated before.

Safety Measures

Because it made for ease of operation, we did not desire to obstruct the charging holes, but we were greatly concerned over the danger of someone falling into them. The covers are lifted by means of electrical hoist, and permit dumping direct in the hole and on the fire. After trying a number of devices, including safety belts, pipe railings were erected around the charging holes. The railings can be removed if necessary, and it was a surprise to the operators how little interference the railings caused. We require men to use goggles when stoking or cleaning the furnaces. First Aid supplies are always available. There has been no serious accident since the plant was placed in operation. Cuts, bruises, and in one case a nail thru the shoe of one of the operators were taken care of by First Aid. We, however, insist that the operator see the insurance doctor. No one is allowed on the charging floor but the operators and the drivers who aid in unloading.

During the first year of operation we had two fires in the storage bin, one of which was quite serious. How the fires started was a mystery. The operators claim that they were set off by matches in the paper, but we always felt there was some carelessness, perhaps a back draught from a fire in the furnace not yet dead. At the end of the first year we installed a sprinkler system above the bin, but strict regulations have been enforced concerning the storage of paper and no further fires have occurred. The building is insured against explosion and fire.

Non-Combustibles and Salvage

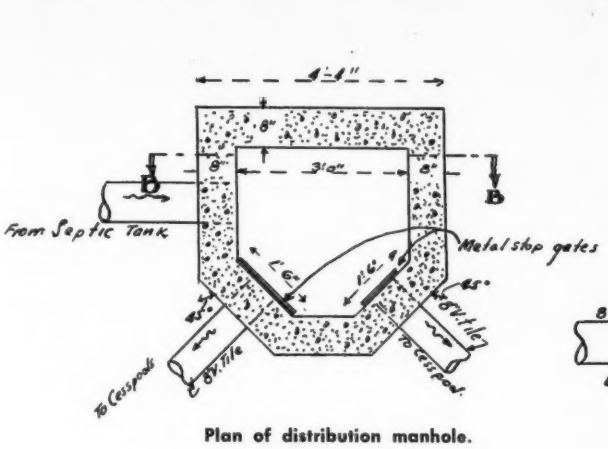
Any article on incineration will be incomplete without some description of the municipal dump and of our salvage program. It is estimated that at least 1400 tons of non-combustible material, about half of which is tin cans and bottles, are collected each year, which is about 30% as much as the combustible material. This must be disposed of in a proper manner, and that manner in our case is by fill. The dump is located very near the incinerator. Strict inspection is made to see that nothing but non-combustible material is placed on the municipal dump.

For the past year we have been dumping our tin cans in a separate location, hoping that there would be a market for them. Now that salvage has been started, a gasoline operated press compresses the cans into a compacted package about one cubic foot in capacity, weighing about seventy-five pounds. (This salvage is for scrap iron, not tin.) Only one dollar a ton is received from the salvage contractor. Campaigning was started last spring for the proper preparation of tin cans, that is, cleaning, removing the paper and flattening, so that tin could be salvaged. This preparation is difficult for the housewife, and has not brought very good results, only about one ton per month being collected.

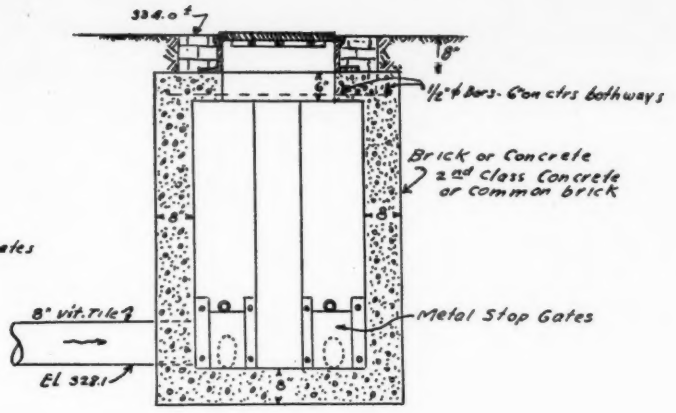
Other salvage programs consist of the collection of scrap metals at their source by various civic organizations, approximately fifty tons a month. Aluminum has always been picked from the refuse by the collectors and certain bottles are collected for the glass in them. Rags also are collected by civic organizations, amounting to about one half a ton a month. The first systematic salvage of any material was started in August, 1940, when the town was divided in half, with one half canvassed for paper one Saturday, and the other the next week. This was done by a civic organization, using volunteer trucks and boy scouts. During the period of a good paper market, the paper amounted to one hundred tons a month, but has now fallen to twenty-five. Hardly any of the salvage programs pay for themselves. Although we have had many private offers, the salvage at the incinerator is done by the incinerator operators, who pay the Borough $300 per year for the privilege and agree that it shall be done on their spare time. They have a small paper press for salvaging whatever paper they can spare at the incinerator.

After three years of operation we raised the dome

(Continued on page 40)



Plan of distribution manhole.



Section of manhole on B-B.

Sewage Treatment for Public Institutions

Typical plants for State institutions in New York State, including leaching cesspools preceded by Imhoff or septic tanks.

By ROBERT C. WHEELER
Of Barker & Wheeler, Engineers

Robert C. Wheeler

IT HAS been our experience that in the sandy soil which we have in the northeastern part of New York State, leaching cesspools are very effective for disposing of the sewage of hospitals, prisons and other institutions. The sand is very fine, so a considerable contact area is required, but I believe they are very much better than subsurface tile drains, due to the fact that it is possible to examine them and find out just what is happening.

It is possible that an article describing our experience with such plants may encourage others to utilize these very valuable implements of the sanitary engineer. I think there is a tendency on the part of some engineers to feel that some of these things are old-fashioned, but under proper conditions they are really very efficient structures and require a minimum of maintenance. The same applies to Imhoff tanks, also; but for a small community without trade waste problems and with a limited operating budget I do not know of anything better.

The following brief descriptions illustrate our experience with this type of institutional plant.

Memorial Hospital, Greene County, New York. This hospital is situated on the outskirts of the village of Catskill, N. Y. It was originally constructed to care for patients having ailments of general character. The capacity was 45, including employees and the medical staff. About 1930 an addition was built to the hospital, bringing its capacity of patients and staff to 75.

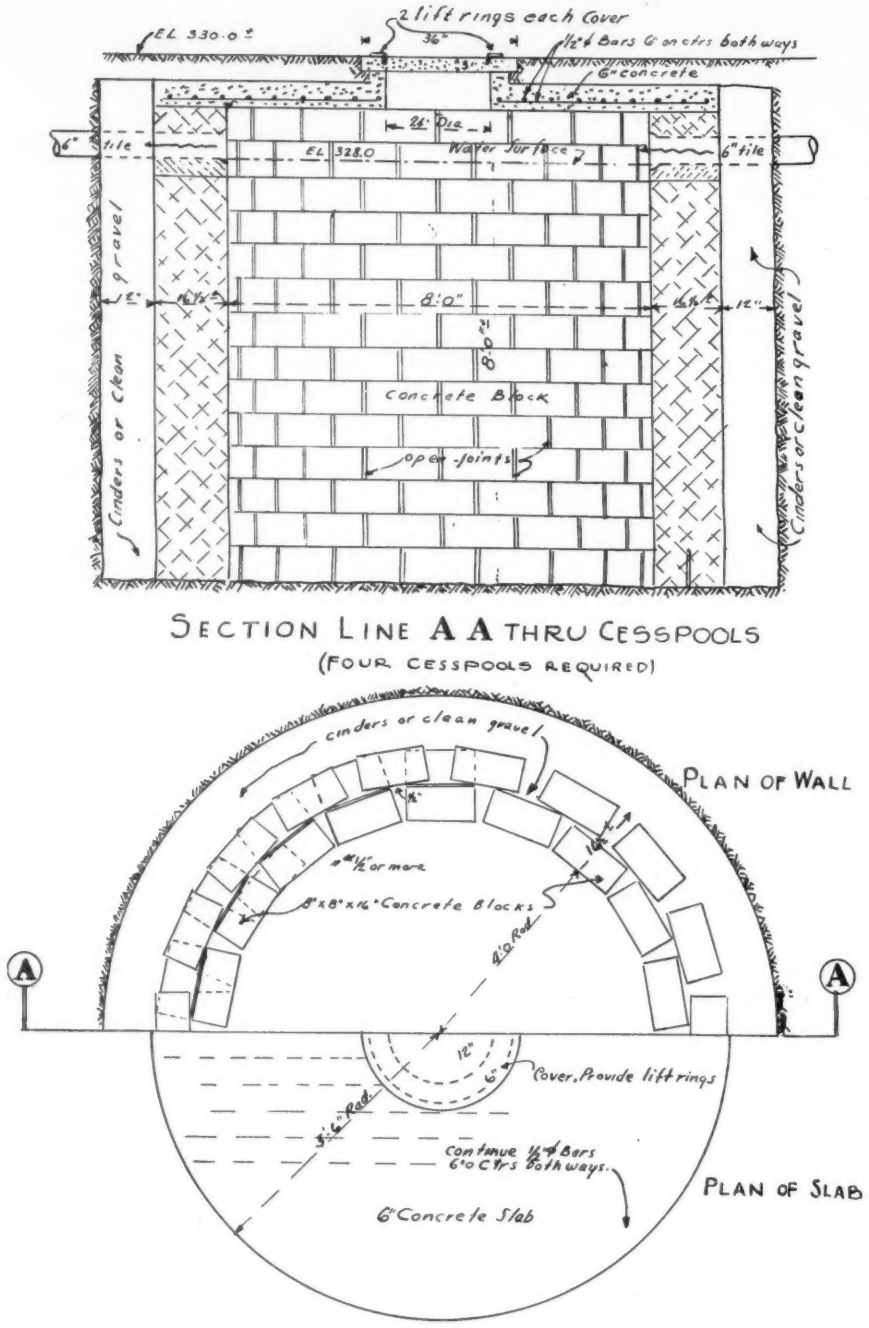
The original sewerage system designed by the architect of the structure consisted of circular septic tanks and seven leaching cesspools. These cesspools were circular, constructed of concrete blocks, with open joints, but were placed entirely too close together and without any protective backing to the circular blocks. The result was that they gave constant trouble, the soil surrounding the pools becoming water logged.

Our problem consisted of repairing the existing pools and providing enough new ones properly constructed to take care of a daily flow of approximately 7,000 gallons. (This quantity was obtained from records of the water consumption of the institution.) It was decided to abandon three of the old pools, in this way providing adequate spacing between the remaining ones, and to construct four additional pools. This number and the percolating area were based on a test made on the bottom of one of the existing pools. (For method of making such test, see description at the end of this article.)

As a further protection to the percolating material, a layer of graded stone 18" in thickness was placed around both the old and new cesspools. This layer consisted of three grades of crushed stone, with the coarser immediately back of the block wall and the finer one on the outside against the natural soil.

The construction work was done under contract in 1938 at a total cost of approximately $3,500. As far as we know, the system is functioning satisfactorily at this time.

Albany Hospital Tuberculosis Sanitorium, Albany, N. Y. In 1934 we were engaged by the Board of



Typical plan and section of cesspool.

Trustees of this institution to report on necessary improvements to the sewage disposal system. The system in service at the time we were called in consisted of a small septic tank, the overflow from which was discharged at a low point in the woods adjacent to the institution.

Considerable nuisance resulted from this method, and inasmuch as sewerage facilities by the City of Albany had not yet been extended to a point at which the institution could connect, it was decided to improve conditions temporarily by the addition of leaching cesspools and a second septic tank, in order to hold the daily flow for a longer period so that the solids might be settled out to a greater extent and not place such a load on the sandy material in which the cesspools would have to be constructed.

The capacity of the institution, including patients, employees, and medical staff, is 125. On the basis of a flow of 150 gallons per capita, the daily volume to be cared for was fixed in round numbers at 20,000 gallons.

From percolation tests it was evident that the number of cesspools necessary would be considerably more than the institution felt they could construct at this time. After several conferences with the Board of Trustees and the State Health Department, the Health Department stated that, in view of the fact that the City of Albany would have sewerage facilities available for this institution within the next five years, they were willing to reduce the number of pools to twelve with the understanding that if these did not function satisfactorily, additional pools would be added, and when the city's facilities were available the institution would abandon the cesspools and connect to the city system. Plans were made and carried out with this understanding. The total cost of the work, which was done by private contract, was about $2,500.

The system functioned very satisfactorily for several years, but it is our understanding that now it has been entirely abandoned and a connection made to the city system on Magazine Street.

St. Agnes School, Albany, N. Y. This institution is a girls' preparatory school located on the outskirts of the City of Albany and a few hundred feet west of the Loudonville Road. The school has a resident population of about 50, and a non-resident population of about 200.

The sewerage system and disposal method constructed at the time the school buildings were erected consisted of a septic tank of 5,000 gallons capacity and several crudely constructed cesspools. These consisted of only a bed of cobblestones into which the effluent from the septic tank was discharged. Some difficulty developed with this original system and a subsurface footage of tile was laid across the lower portion of the athletic field. This also proved to be quite unsatisfactory, as the location was too near the surface, the extent of the tile was inadequate, and the effluent worked up to the surface, creating quite a nuisance.

In the summer of 1942 we were called upon by the Building Committee of the school to investigate conditions and recommend improvements. After a field survey, including determination of water consumption and percolation tests, we recommended the construction of four new cesspools located on higher ground and constructed of concrete blocks backed by gravel. A local contractor who had done the grading on the original construction work was engaged to construct these pools, with the connecting pipe lines and man-

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Airport Promotion and Planning in Wisconsin

By M. W. TORKELSON

Director, Wisconsin State Planning Board

Development of municipal airports in that state stimulated by the State Planning Board and WPA assistance. The importance of such development in all states and how to promote it.

THE development of airplanes and of airports must go hand in hand, for airplanes cannot operate effectively, especially on a commercial basis, unless there are adequate airports in sufficient number and proper locations. In view of the recent spectacular development of airplanes, there must have been a great many such airports distributed over the country. But very few of them were in Wisconsin. In 1941 there were not more than three or four airports offering facilities necessary for scheduled flights, although there were about 40 where small planes could land and take off. An excellent airport enabling act was passed in 1937, providing for an Aeronautics Commission, but no appropriation was made adequate to support it.

In August 1941 the writer, who is the executive officer of the State Planning Board, was requested by A. H. Wait, Regional Airport Engineer of the Civil Aeronautics Administration at Chicago, to take the steps necessary to have the State Planning Board sponsor an airplane planning project under WPA, the objective of which would be to make working plans for airports for such local governments as might desire them. This was done and the project was approved in November 1941, at once began functioning and is still active.

Counties and cities which were thought to be interested were notified that

"This service will be rendered free to communities desiring it who comply with the following. The community must:

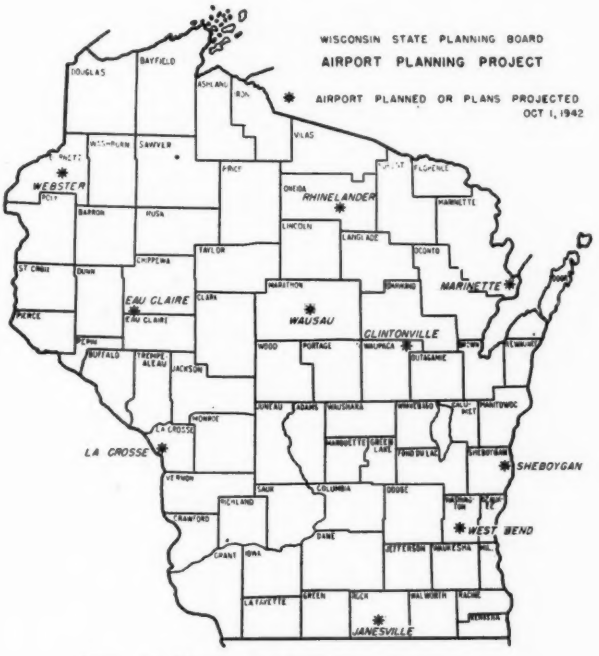
"(1) Own or have under option all or a major portion of the land required for the development of a Class III airport (that is, 3,500-foot minimum runways).

"(2) Give assurance that properly qualified technical supervision will be provided throughout construction.

"(3) Agree to protect the aerial approaches to the airport through zoning or otherwise as provided by state statute.

"(4) Agree to take over the airport upon completion and to maintain it as a public airport."

The first to respond was Rock County, a highly developed agricultural and industrial area of about 720 sq mi. containing Beloit and Janesville and a number of smaller cities and villages. A substantial number of the citizens were interested in flying and there were in the county several airports, but none developed beyond the most primitive necessities or capable of the expansion that the anticipated development of commercial aviation would make necessary in the next ten years or sooner, and the objective was to develop an airport which eventually would become a Class IV airport. The County Board of Supervisors is one of the most conservative minded in the state, and it was necessary first to induce it to purchase the necessary land. The local press was air-minded and air-minded citizens were active. The county board was told: "If the county will buy this land we have immediately available the means for making plans for the airport, and with these made we can secure federal aid for the initial construction through WPA." Some members of the board strongly opposed spending any money for any purpose; but eventually a majority of the county board was convinced, the money appropriated and the land bought.



State of Wisconsin, showing airports planned.

Meantime work on the surveys and plans had begun as soon as land was optioned and was well along when the money was appropriated and was completed during the winter of 1941-42, greatly assisted by the office of the city engineer of Janesville. In the spring of 1942 construction was begun and the airport was usable by September, though far from what is contemplated eventually; the plans calling for runways

(Continued on page 38)

Broad Creek Village, Norfolk, Va. A Defense Housing Project for 2600 white families.

House construction in a court, Norfolk project.

Municipal Improvements for Large War Housing Projects in Norfolk and Portsmouth, Virginia

By HARRY W. ALEXANDER

Project Manager for Harland Bartholomew and Associates

Discussion of the engineering problems encountered in designing and constructing the municipal improvements for an 8400-dwelling unit project.

ONE of the most acute housing situations in the entire country developed in the Hampton Roads Area shortly after the vast naval expansion was initiated as part of the National Defense Program. Despite strenuous activities on the part of private developers and the local public housing bodies, the supply of new housing fell far behind the rapidly expanding need. The entrance of this country into war in December 1941 made it immediately apparent that a large public housing program must be initiated and carried to complétion at the earliest possible moment.

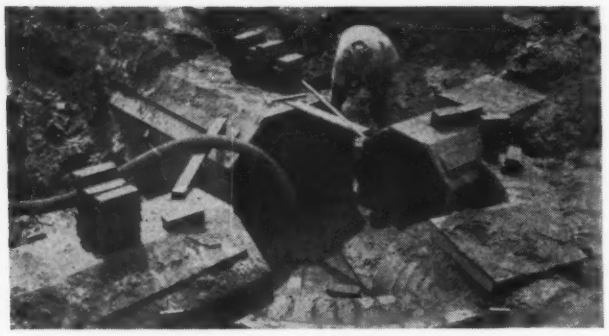
As soon as a determination had been made by Washington authorities as to the number of dwelling units needed in the Hampton Roads area, a program was drawn up allocating the dwellings between Newport News, Norfolk and Portsmouth, the principal communities affected. In developing this program, two primary considerations were kept in mind: First, the urgent necessity for speed; and second, avoidance of post-war municipal headaches because of an oversupply of permanent housing no longer needed as naval activities lessened. These considerations led to the decision to erect pre-fabricated, demountable family dwelling units. The Federal Works Agency was in charge for the Government.

The original program contemplated a total of 16,700 dwelling units distributed as follows: Newport News, 5200; Norfolk, 6500; and Portsmouth, 5000. Subsequently, this program was revised, and at present there are 3400 dwelling units under construction in Norfolk and vicinity and 5000 in the vicinity of Portsmouth. This article will be confined to the work being done in Norfolk and Portsmouth.

Early in January, 1942, the Federal Works Agency, through Rufe B. Newman, Assistant Administrator, entered into an agreement with Harland Bartholomew and Associates of St. Louis to undertake the engineering and architectural work involved in the construction of these projects. R. Stuart Royer, consulting engineer of Richmond, Virginia, was associated with the St. Louis firm on this work. Sites were selected and surveys begun early in February.

Four separate projects make up the program in the Norfolk-Portsmouth area. The largest of these projects is located just outside the city limits of Portsmouth and consists of 4250 dwelling units for white occupancy. Adjacent to this site and partially within the City of Portsmouth is a negro project consisting of 750 dwelling units. The third project lies just to the east of the City of Norfolk and comprises 2600 dwelling units for white persons while the fourth project lies entirely within the city limits of Norfolk and consists of 800 dwelling units to be occupied by negroes.

Because no one could anticipate the housing needs of the area after the war, it was decided to plan each



Wood pipe culverts at a manhole, Norfolk.

project in such a manner that, if the houses were later removed, the municipal improvements would be adaptable to normal subdivision development and the money spent in their construction would not be wasted. At the same time the need for speedy construction and economy was fully realized.

The planning problems include those encountered in designing complete self-contained communities ranging in size from one covering 900 acres and having a population of approximately 17,000, to the smallest of the four which embraces 128 acres and which will have a population of 3,000. In addition to the dwelling units, each of the four projects is to be provided with school facilities, commercial centers, fire stations and buildings for management and social activities.

Following consolidation, by executive order of the President, of the numerous Federal housing agencies into the National Housing Agency early in 1942, all war housing contracts were executed by Region III of the Federal Public Housing Authority, Oliver C. Winston, Director, and the regional office took over the direction of the entire Hampton Roads program. A sub-regional office was subsequently established in Norfolk under the direction of George L. Reed to coordinate work on all projects.

This article is concerned primarily with the engineering features of the municipal improvement work, and no attempt will be made to describe the house erection, the various aspects of which have been discussed in other publications.

Roadway and Surface Drainage Design and Construction

Speed and economy of construction were controlling factors in the design of the roadway and drainage systems. The Norfolk sites were located principally in areas that had been farmed and cultivated to such an extent that they were comparatively well drained, and the water level in most instances was from four to six feet below the surface of the ground. Because of this fact it was decided to use wood curbs on the minor streets and concrete curb and gutters on the main streets, and to take care of the drainage by means of large open ditches on the perimeter of the project, supplemented by auxiliary feeder ditches extending through the rears of the projects where necessary.

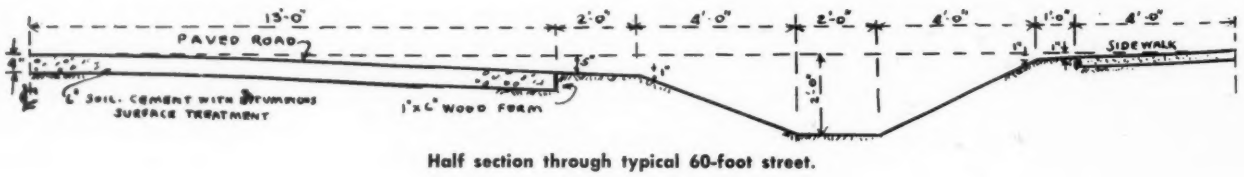
The Portsmouth sites were poorly drained, and the ground water level, in some cases, was within eighteen inches of the surface. Because of this, this project was designed with large drainage ditches from four to eight feet deep, located in the center of the main thoroughfares, with 20-foot roadways on each side. Thus, the drainage ditches serve as a median strip for dividing the lanes of traffic on the principal thoroughfares. These main ditches were supplemented by others around the perimeter of the project and by interior ditches running through the project wherever site conditions warranted the use of them. Curbs were omitted from all streets except the main thoroughfares, which had concrete curb and gutters, and surface drainage was taken care of by means of open ditches between the edge of the roadway and the sidewalk line, 2 ft. deep and 2 ft. wide at the bottom.

Because of the extreme flatness of the land and the low elevations (12 to 15 feet above mean sea level) it was necessary to use extremely flat grades in all cases. Where curbs and gutters were used, grades were as low as 0.2%, and where open ditches were used it was often necessary to limit the grades to 0.1%. This practice is normal for this area; if higher rates of grade had been used, it would

A line of wood pipe drain.

have necessitated an excessive amount of storm sewer or drainage ditches, which would not have been at all desirable. The drainage ditches were all installed as soon as possible, and they proved to be exceedingly valuable during the construction period. During the month of August there was fourteen inches of rainfall within a period of ten days, and although the ditch systems were not complete at that time, they functioned enough to prevent serious damage, and they carried away the surface water so that construction could be resumed without undue delay.

The proper surfacing of the roadways presented a rather difficult problem because of the huge amount of materials involved plus the fact that other defense work in the area was taxing all available sources of supply. This made it necessary to attempt to secure independent local sources of material which could be trucked directly to the sites. After a diligent search,



Half section through typical 60-foot street.

sources of sand and clay were finally located. On the Portsmouth side, a sand-clay pit, meeting the requirements of the Virginia State Highway Department, was found within twenty miles of the sites. On the Norfolk side a suitable supply of sand-clay was located approximately four miles from the projects. This material was composed of five per cent clay, ten per cent silt, thirty-five per cent fine sand, and fifty per cent coarse sand.

The sand-clay material is mixed at the pit with a shovel as it is loaded, and placed at optimum moisture content so as to get the best possible compaction. After it has been deposited on the subgrade at the site, it is thoroughly disked and graded and compacted with a sheeps-foot roller, after which the mechanical grader is used, and final compaction is obtained with a seven-ton roller.

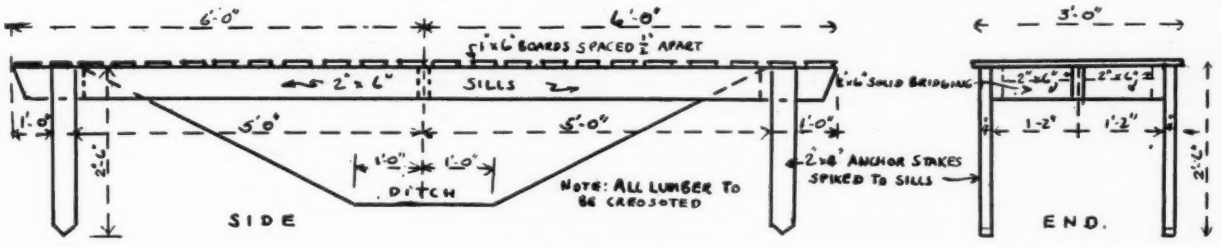
It was originally planned to surface all of the main thoroughfares with a one-inch plant-mixed bituminous surface and to seal the minor roads with a bituminous seal coat. Because of the scarcity of bituminous materials and the consequent restrictions placed on their use by the Bureau of Public Roads, it was found necessary to limit all surfacing to a seal coat, which consisted of a prime coat of 0.3 gallon of tar per square yard. After the prime coat has set, an additional application of 9.4 gallons of tar per square yard is applied and the surface is covered with 40 to 50 pounds of No. 9 stone chips, after which the surface is rolled with a seven-ton roller to obtain final compaction.

At the time this article is written, the roadway surface has not been in use long enough to determine definitely how it will stand up under traffic, especially in spots where subgrade conditions are poor. However, as stated previously, inability to get sufficient quantities of the suitable materials usually used in this area dictated its use. Furthermore, it was felt that after the war, this material could, if necessary, be stabilized with either cement or bituminous material.

Forms for concrete curb and gutter.

A Portsmouth street, showing foot bridges.

The street systems of all projects were co-ordinated with the municipal and county highway systems to facilitate the flow of traffic to and from the projects. Purely local streets serving only the residents were given widths of 26 feet; main thoroughfares have roadway widths of 36 feet, and a few thoroughfares were planned with 100 feet right-of-way with two 20-foot roadways on either side of the center drainage ditch. The street system was planned so as to concentrate traffic on a few main thoroughfares and discourage it from using the minor residential streets. The roadway surfacing was eight inches thick on main thoroughfares and six inches in the minor streets and courts.



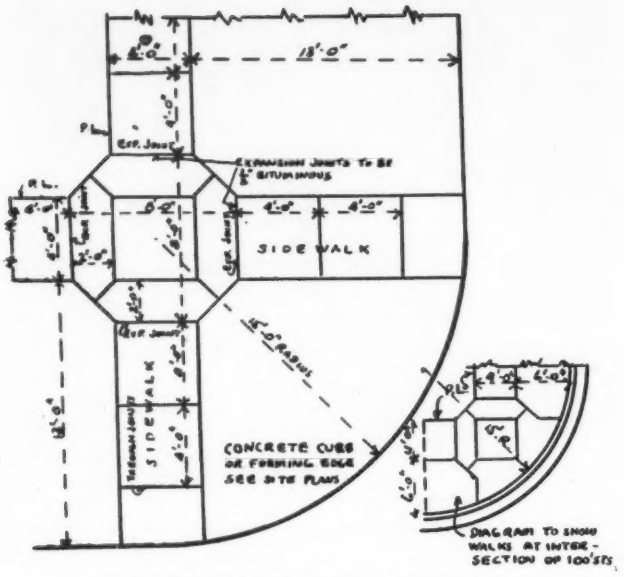
Details of foot bridge.

Where wood curbing was used, it consisted of creosoted 2″ x 12″ No. 2 yellow pine planks attached to creosoted 2″ x 4″ stakes 2 feet long and spaced five feet apart. After line and grade had been established, the stakes were driven by a hammer operated by a portable air compressor. It is realized that this type of construction is more or less temporary, but its use eliminated the serious problem of securing aggregate for concrete (a critical material in the Hampton Roads area) and to date the installations have proven satisfactory.

On those streets with side ditches, wooden bridges were designed to provide access from the roadway to the sidewalk and dwelling units.

The construction of drainage ditches was carried out in advance of the other site improvement work in order to provide material needed for fill under the houses and to lower the ground-water table. It is planned to seed or strip-sod the side slopes of the ditches to reduce erosion and maintenance costs as much as possible.

Concrete pipe and laminated wood culverts were used to carry water under the roadways and to ditch outlets. The wood culverts (supplied by the Armco Drainage Products Association) were substituted for metal and reinforced concrete pipes in order to save on critical materials.



Detail of sidewalk at street intersection.

Sidewalks: The original design called for four-foot concrete sidewalks to be built along one side of the street only. Front walks leading to the houses were to be three feet concrete and rear walks two feet wide. After construction began, however, the difficulty in securing concrete in the Hampton Roads area led to a decision to substitute slate stepping stones for the front and rear walks. This material was not only readily available in sufficient quantities but had the added advantage of being rapidly laid and of a high salvage value.

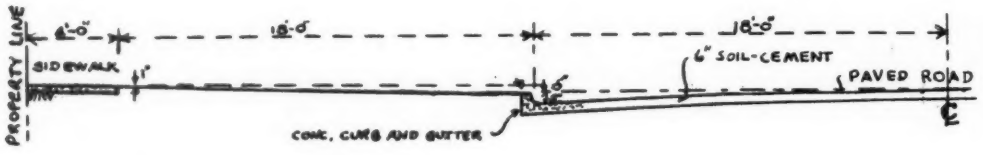
plans, together with complete details, specifications, several typical 50-scale block plans and an estimate of the amount of work involved, were prepared as a basis for bidding and award of contracts. When bids were called for, no satisfactory bids were received, principally because of the large amount of work being done in this area, and as a result, contracts for these projects were awarded on a cost-plus-fixed-fee basis, the last one being signed May 6, 1942.

The Sewerage Systems

Plans for the sewer systems on all projects were co-ordinated with the Hampton Roads master plan for sewage collection and treatment as developed by the Hampton Roads Sanitation Commission. This long-range plan was designed to meet the anticipated needs of the Hampton Roads area brought about by the unprecedented influx of new population and the urgent necessity of eliminating the pollution of tidal waters in and adjacent to the several communities in this area. Financed in part by Federal funds and in part by local bond issues, the Commission's program will be carried out over a period of several years.

Inasmuch as the master plan provides for ultimate treatment of all sewage originating in the area, it was deemed inadvisable to provide separate treatment for the sewage from the various housing projects and their outlet points were located so as to connect to existing or proposed sewers so that final disposal would be in accordance with the Commission's program.

Sanitary Sewer System: Two important factors influenced the design of the sanitary sewer system. First,



Half cross-section through an 80-foot street with 5-inch crown; 1-inch plant-mix bituminous wearing surface.

Planning and Surveys

As soon as the first site was selected, early in 1942, topographic surveys were begun and planning of the projects was started. The planning was done on the basis of preliminary information, which later was adjusted to fit conditions as the final topographic information was obtained. Site selection, land acquisition, property line and topographic surveys and planning were all carried on simultaneously because construction was to begin at the earliest possible time.

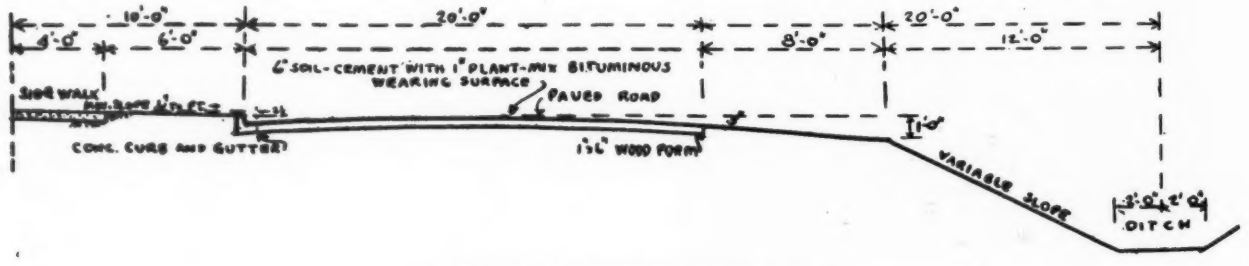
On the two small projects, complete plans and specifications were prepared and bids were taken on a unit price basis. The first contract was awarded on April 6, 1942.

As a time-saving measure on the two large projects, 200-scale site plans and 200-scale sewer and water

the flat ground necessitated the use of extremely flat grades in all cases; and second, wet ground conditions made it imperative to reduce the amount of deep cut to an absolute minimum. Poured asphalt joints were used on all sewers over four feet deep. House connections were laid with cover as low as two feet at critical points.

Sewage from the 900-unit Norfolk site is conveyed into an existing pumping station. The 3,000 unit Norfolk site has three pumping stations, and final disposal is through a 16″ cast-iron force main into a 27″ gravity sewer now under construction by the City of Norfolk.

The 750-unit and 4250-unit projects in Portsmouth have two pumping stations which outlet into a 27″ gravity sewer, which in turn outlets into an off-site



Half section through typical 100-foot street.

pumping station under construction by the Federal Works Agency, which lifts all the sewage through a force main into an existing city sewer.

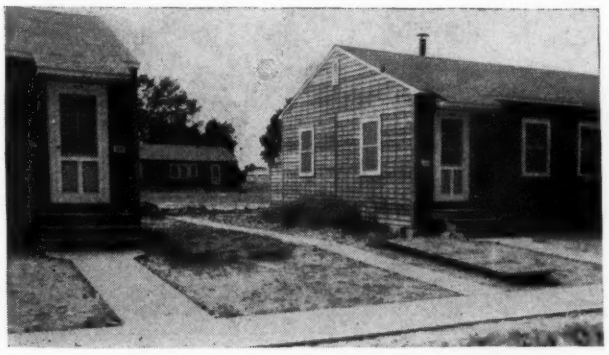
Since the ground-water level was only from two to four feet below the surface of the ground and because the soil consisted of silt and sand with occasional seams of clay silt, the sewer construction was extremely difficult and required the use of a huge amount of well points, sheeting and heavy equipment. On practically all sewers over six feet deep well-points were necessary, and on the deepest lines it was often necessary to provide two parallel lines of well-points in order properly to dewater the trenches. One of the contractors used well-point equipment consisting of a header with well-points attached to it by means of flexible rubber hose that worked exceedingly well on sewers up to ten feet deep. The trench was excavated by machine to ground water level, and the well points were then inserted along the side of the trench to the required depth. After dewatering, the balance of the cut was made by hand.

A technical discussion of the design features of the sewer system and sewage pump stations will be given in the second part of this article.

Water Distribution System

The Norfolk projects tap existing water mains of adequate capacity adjacent to the sites, and no special problems were involved on these sites. The Portsmouth projects are located a considerable distance from the city pumping plant, and in order to provide an adequate water supply it was necessary either to construct additional mains from the pumping plant or to tap the city low-pressure main adjacent to the project and provide a pumping station to give the required pressure. This problem was worked out on the basis of the latter alternative in co-operation with the City of Portsmouth, and a 4 m.g.d. pumping station is to be built on the project site. The project water system and the City system have been interconnected so that in case of emergency both the City and the project systems will be available for joint use.

Progress on the water distribution systems was delayed for a considerable time because of priority difficulties and restrictions of the War Production Board. At their request the water distribution systems were redesigned and pipe sizes, hydrants, valves, corporation cocks and other critical materials were reduced to an absolute minimum. Fortunately, the decision to construct a pump station on the Portsmouth site resulted in a considerable saving of critical materials. The distribution system consists of cast-iron pipe with steel service pipe, and brass spuds were used for tapping the mains in place of corporation cocks in order to conserve critical materials. Ground conditions were such that even in laying water pipe it was necessary to dewater the trenches, and in many instances it was necessary to do a large amount of pumping in order properly to install and test the water mains and services.



Showing house and sidewalk construction.

House construction in a court.

Street and sidewalk construction.

A technical discussion of the design of the water distribution system and water pump station will be given in the second part of the article.

Gas Distribution System

Because of the inability of the local gas company in Portsmouth to increase its plant capacity sufficiently to provide service on the two projects located near that city, cooking and hot water heating will be done with coal. One of the projects located within the city limits of Norfolk will be served by the local utility company from their available supply of manufactured gas.

The fourth project, just outside Norfolk, which consists of 2600 dwelling units, will be supplied by a system of liquefied petroleum gas. Non-poisonous natural gas is supplied to each dwelling unit for cooking and automatic water heating from one central station located on a railroad siding bounding the project. Late model automatic storage water heaters and ranges are installed in each unit. Gas is metered to each tenant by individual meters.

The entire system was designed and installed by Modern Gas Company Inc., which together with the associated Rulane Gas Service, Inc., are pioneers in supplying large housing projects with liquefied petroleum gases. Natural gas for this project is refined and liquefied for shipment in tank cars at West Virginia plants controlled by the company. Upon arrival at the project siding, it is transferred while still a liquid into storage tanks having a capacity of approximately one month's consumption. Latest type of automatic steam vaporizing equipment has been installed which will permit the plant to utilize any mixture of Propane and Butane that may be received. Compressors, boiler, master meter, and regulating equipment are housed in one fire-proof control building, which also has office space for the plant operator.

Approximately 40 miles of underground gas mains have been installed. Only dry vaporized gaseous gas is distributed in the mains. Gas is distributed at approximately 10 pounds pressure per square inch, but

House construction in a court.

Houses prior to completion of street work.

each dwelling unit has its own regulator, which reduces the pressure to the six-ounce pressure required by the domestic appliances.

Electrical Distribution

The overhead electrical distribution systems to serve the four projects is the familiar 4160-volt, three-phase, sixty-cycle, wye-connected common neutral system originating at the 11,000-volt to 4160-volt transformer substations located on each project.

The site plan drawings which indicate the street and house layouts were duplicated, and upon these drawings the substation locations were determined from the local public utility's 11,000-volt availability. The 4160-volt primary distribution system was then indicated on the drawings and correlated with the 120-240-volt secondary distribution system of wires, which are likewise supported on the electric poles strategically located to enable the electrical contractor to install service drop wires to the dwelling unit or group of units. In order to secure ample street clearance for the service drop wires to the houses on the opposite side of the street from the electric line, it was found necessary to attach them to the gable ends of the housing units. This was found to fit in very well with the interior house wiring layout, which indicated the main switch and load center on the rear wall of the kitchen of each housing unit. It would have been much more advantageous to have had rear electric distribution, with service drop wires direct from pole to service weatherhead, than the pole lines along the streets; however, because of the site planning layout with court arrangements and block widths unsuitable to rear distribution, it was necessary to place the pole lines along the street. From the gable ends, service entrance cable was run along the rear of the housing unit under the eaves and tapped on the outside of the house to the lead-in wires connected to the line side of the main switch. Where the housing units were coupled in a row, the service entrance cable was extended along the rear in order to connect each family unit.

The original substation and electrical layout plans were predicated on building a standard distribution system to correspond with the local utility's standards of construction, in order that, after the emergency caused by the war effort, the installations would serve for standard residential systems in case the demountable units were removed and permanent homes constructed upon the different sites.

The original plans were compiled in the winter and spring immediately following the outbreak of war. Following the letting of contracts for construction in late spring, rigid restrictions were imposed on the use of copper, steel, and other metals necessary to the war effort, and it became necessary to redesign the construction plans and details to conserve wherever possible.

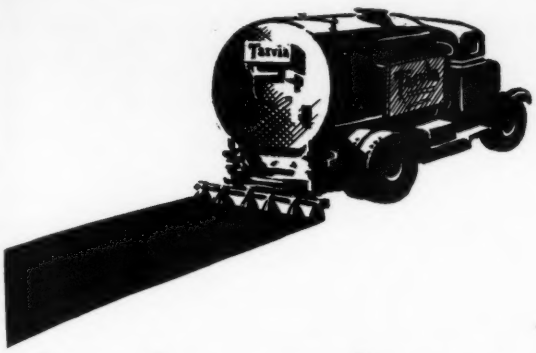
Accordingly, wire sizes were reduced to a bare minimum to supply the houses on the basis of 200 watts for each dwelling unit, and poles to support the wires serving the houses within the courts were eliminated. Service cable was extended from the rear of the houses facing the streets to the rear of the houses facing the courts, thereby reducing the pole framing hardware, guying material and wire.

On the remaining poles along the street every effort was made to permit the primary distribution hardware to remain standard except for employing a minimum of metal content; however, the multiple street lighting circuit and the secondary distribution systems were redesigned for support by Western-Union-style wooden brackets, sometimes referred to as telephone logs, and in this manner considerable steel was eliminated. Wherever possible, anchoring and guying were eliminated, and the screw type anchor was supplanted with a minimum size anchor rod bolted into a creosoted wooden log imbedded in the earth. In some instances the push pole brace was employed to reduce further the amount of steel.

The street lighting system is the multiple cascade type. The master clock connects a section of the street light control circuit to one of the hot secondary distribution circuit wires, and the lamps within this section are lighted and any street lighting relay within the same section is likewise caused to operate and connect other street lighting control sections to a hot secondary distribution wire supplied from a convenient transformer and the lamps within these sections become lighted. When all of the relays have been energized, all of the lamps are burning. When the master clock contacts are opened, all of the relay contacts will open and extinguish all lamps, and in case of breakage of the control circuit at any point all of the relay contacts beyond the point of breakage will open and the lamps will not burn. In case of a blackout, a master blackout switch can be opened to instantly extinguish all lamps without disturbing the time clock mechanism. The common neutral wire is employed for the ground or return for the street lighting circuit.

During construction, delays were encountered from shortages of material and labor and unduly inclement weather. However, every effort was made to concentrate on strategic areas where houses were in course

Griffin wellpoints installed for constructing a deep sewer.



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of completion and other utilities were available for immediate usage. As very commonly found, the houses first available for occupancy were at the opposite side of the project from the source of electric power, and it was necessary to complete the main feeder lines extending a mile or more before electricity could be made available for the houses desired. The local public utility was very co-operative with regard to supplying temporary electric service in limited quantities to some houses which were completed before the electrical contracts were awarded.

Technical Aspects of the Water and Sewer Systems

Water Supply

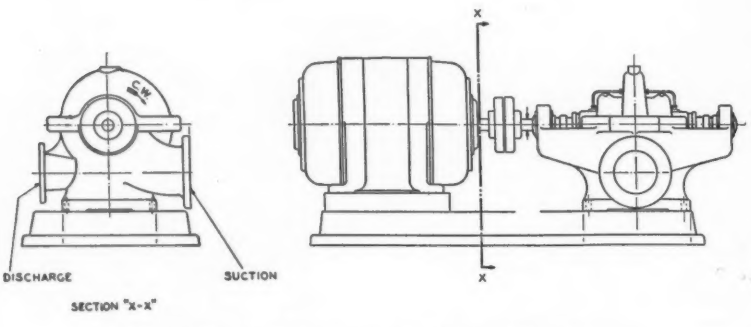
Sources. Water was supplied to all of the projects from the mains of the city in or near which the site was located.

In the case of the 5000 unit project near Portsmouth, the water was taken from a low pressure transmission main at a pressure of about 15 pounds and by means of pumps on the site the pressure was raised to 50 pounds. The pump station was equipped with three direct-connected centrifugal motor-driven pumps and one pump which can be driven either by motor or gasoline engine. One 4 x 3 inch pump direct-connected to a 20-horsepower squirrel-cage induction motor was capable of delivering 450 gallons per minute, and two 5 x 4 inch pumps direct-connected to 40-horsepower motors were capable of delivering 900 gallons per minute, all against 60 pounds pressure when supplied with water at 15 pounds pressure when the pump is being driven at 1750 revolutions per minute.

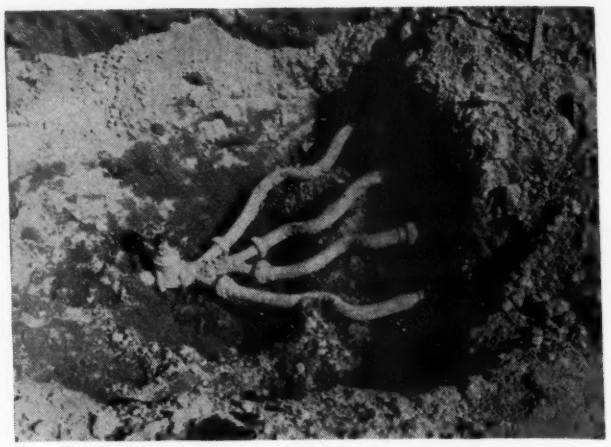
The fourth and largest pump was 10 x 8 inches, connected to a 100-horsepower motor, capable of delivering 1800 gallons per minute at 80 pounds pressure when supplied with water at 15 pounds pressure and when driven at 1160 revolutions per minute. This pump was arranged for dual drive by a gasoline engine that develops 160 horsepower at 1650 revolutions per minute, at which speed the pump delivers 2550 gallons at 80 pounds pressure. All pumps were supplied by Fairbanks-Morse.

The pump capacities were chosen so that the smallest pump will carry the light load; either of the two next larger pumps will carry the average day load, and together they will carry the maximum domestic day load. The large pump when motor driven is capable of carrying the maximum day load and, with one of the middle sized pumps, the fire load; and when connected to the gasoline engine it will, when operating at maximum speed, carry the maximum domestic and fire loads combined.

The use of a gasoline engine as a stand-by rather than an elevated tank seemed to be indicated, first by



Fairbanks-Morse single-stage, split-case centrifugal pump.



Two-inch pipe connection to a 6-inch main.

the desire to conserve steel and second by its economy in first cost. An elevated tank would have provided more uniform pressure but it was felt that conservation of steel was more important.

Uniformity of pressure is secured through pressure operated switches which automatically start and stop the various pumps as the water demand increases or decreases.

Metering. The water to each project is measured through master meters located at the take-off from the city mains. Individual services are not metered and the cost of water to each tenant is included in the rent.

Because of the fact that high pressure water mains were available on the Norfolk side, no booster pumps were required for the two projects located there.

Distribution Mains. The water distribution systems are based on a demand of 100 gallons per capita daily, with a peak load 200% of average. This is about 30 gallons per capita greater than is usually figured on housing projects of this type, but was arrived at after considering the type of occupants and the fact that none of the services was to be metered, the cost of water being included in the rent. The fire demand was figured at 1050 gallons per minute and this was superimposed on the peak domestic consumption to determine pipe sizes.

The Hardy Cross method of balancing circuits was used to compute the losses in the system. From a map of the site showing the type and location of the houses, the population of each block was determined, and the maximum water demand in gallons per day for each block was figured. These figures were placed within the appropriate block on the map. Then a fire demand was placed at an assumed location on the map. The total demand, fire and domestic, was then determined and equated to 100%. The per cent of demand for each block was determined and a take-off located at some point on the perimeter of the block, usually at the intersection of two streets or two mains.

From these take-off percentages and the total demand, a tentative pipe grid was laid out, and flows were assumed, in percentage, for each reach of pipe. Each circuit was then balanced by the Hardy Cross method and the flow in each reach adjusted accordingly. The circuits were balanced again and a second adjustment made. By this time the circuit balanced within 1% which was considered sufficiently close for this project.

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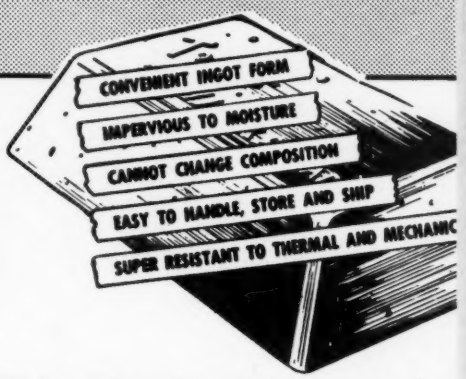
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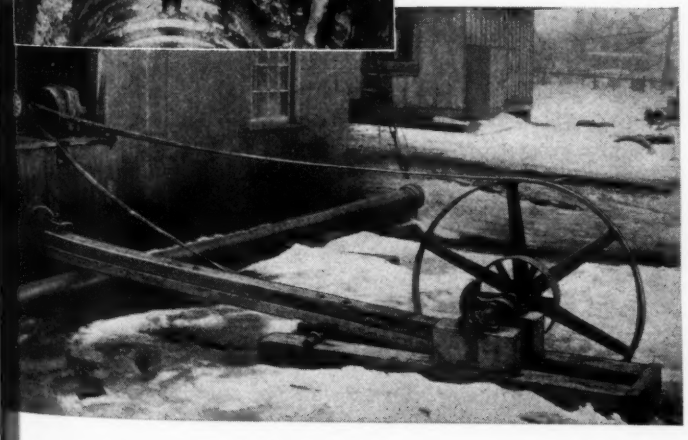

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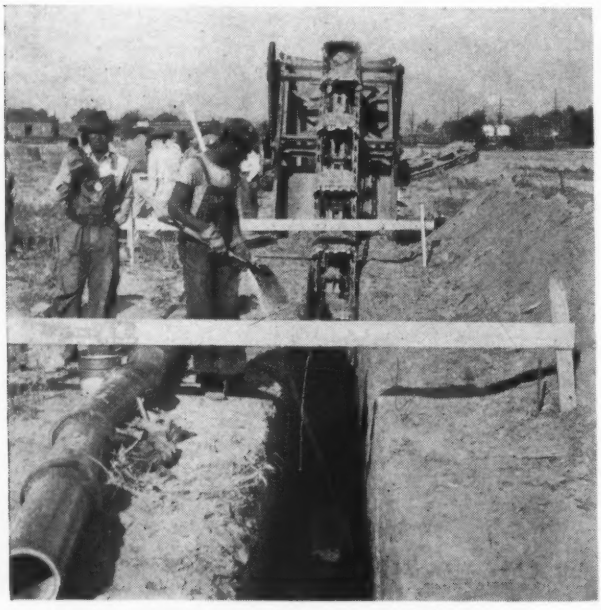
points, such as the project supply main and the assumed location of the fire, was then determined by the formula:

$$H = \frac{eh}{100{,}000} \times (gpm)\ 1.85$$

In which: H = total loss of head in feet
eh = the computed losses, between the points in question.
and gpm = total flow in the system in gallons per minute.

The system was designed so that the pressure in the mains would not drop below 10 pounds at times of maximum demand.



Constructing sewer lateral in Norfolk project.

Construction. Centrifugally cast iron pipe class 150, in sizes from 4″ to 14″, was used for the mains. Difficulty in obtaining valves at the start of the project resulted in a partial redesign of the system in Norfolk, with the result that valves were omitted from all hydrant leads.

Mains were laid with 30″ of cover and jointed with one of the sulphur compounds.

Two methods of testing were used: Where joints were left exposed, a visual examination was made with the pipe under 150 pounds water pressure. This may seem like an excessive pressure when it is considered that the working pressure will be only about 50 pounds, but the high pressure has the advantage of showing up defects, such as split pipe, which might remain in service at the working pressure for some time, before failing. In some cases the lines were covered before tests could be made and then a leakage test was used. This test required that the leakage from a line be less than 2 gallons per inch of diameter per 1000 feet of pipe per hour when subjected to 150 pounds pressure for at least one hour. Few leaking joints were found but the inspection revealed several split pipe which had found their way into the lines and two hydrants which were leaking badly due to improper assembly.

Service Connections. In all cases the water mains were laid eight feet back of the curb and the service from the main to each unit on the side of the street adjacent to the main was made with a ¾″ galvanized pipe. To the houses on the side of the street opposite the main, the services were carried across the street in 1″ or 1½″ pipe and distributed to the units in ¾″ and 1″ pipe.

It was intended that all connections to the main be made with corporation cocks and lead goose necks, but due to delay in securing this material the contractor was permitted to tap the dry main and make his connections through a swing joint made up of three elbows. For the swing joints, taps up to 1½″ were used. As soon as corporation cocks and goose necks were obtained the swing joints were discontinued. For ¾″ and 1″ connections, corporation cocks of the appropriate size were used. For 1½″ connections a 3-branch connection with three 1″ corporation cocks was used. Courts with sixteen units or less were serviced from a 2″ pipe which was connected to the main with a 4-branch connection and four 1″ corporation cocks. Courts or cul-du-sacs with more than sixteen units were serviced from a 4″ cast iron main through corporation cocks and goose necks in the usual way.

Sewerage

Design. The sewers were designed on the basis of a water consumption of 100 gallons per capita daily with a peak sewage flow of 250% of average and the sewers flowing half full. Capacities were taken from a flow chart computed from Chezy's formula using n = 0.015. A minimum velocity of 1.5 feet per second was established and, owing to the flat terrain of the sites, most of the sewers were laid on the minimum grade.

Flow quantities were determined by a house count from the site plan using a figure of 3.2 persons per housing unit. In figuring the flow in a reach of sewer, the sewage contribution along the reach was assumed to have entered the sewer at the upper end of the reach.

A study of the cost of building sewers in the Norfolk and Portsmouth areas revealed that the cost per foot increased very rapidly as depths increased over twelve feet. With this in mind, the topography of the sites were studied and pump stations located to serve the largest possible area and still keep sewer depths to a minimum and force mains as short as possible. This was accomplished with three pumping stations on the Norfolk site and three on the Portsmouth site. Further study reduced this figure to two and placed a City of Portsmouth station adjacent to the site.

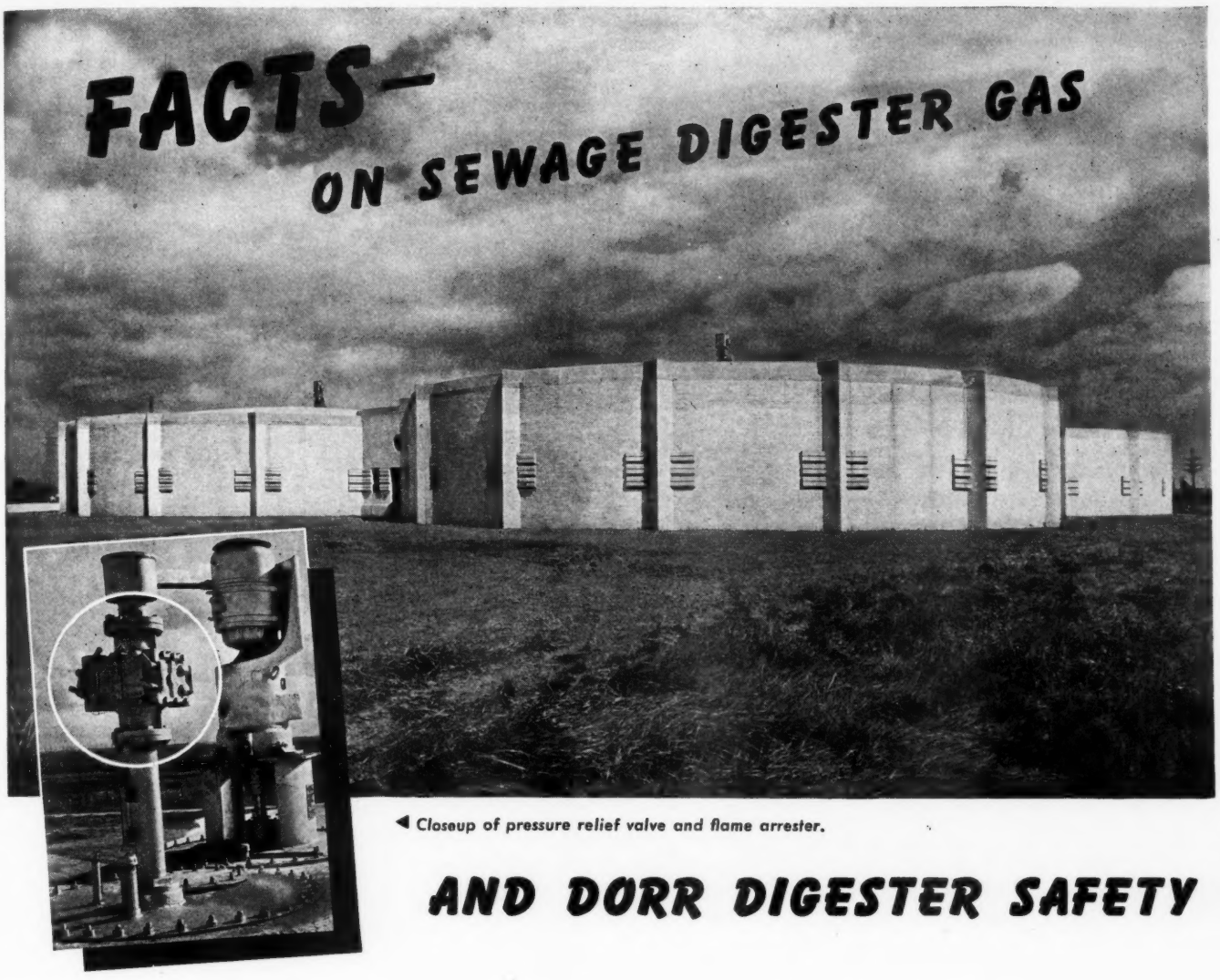
Construction. The specifications permitted the use of cement in making joints if they could be kept free of water till the cement has set. This proved difficult because of high ground water and the difficulty in obtaining well points. After considerable trouble with unsatisfactory cement joints, the contractor on the Norfolk site switched to poured joints of the G-K type and eliminated one of his greatest sources of delay.

Difficulty in getting delivery on sheeting and well points delayed construction on the deeper sewers for some time, with the result that the upper ends of nearly all the sewers were completed before the lower sections and mains were started. This is an unsatisfactory and expensive method of construction and was resorted to only because it was felt that time would be saved.

Construction was started on June 18th and completed on November 28th. In this time more than 30.5 miles of sewer and laterals were built, or an average of about 1000 feet a day.

A large part of the trench excavation was in a sand which would stand at a rather high angle when the water had been removed. These were ideal conditions for open cut excavation, unwatered with well points, and much better progress could have been made if more well points had been available.

At first it was the practice of the contractor to have



◀ *Closeup of pressure relief valve and flame arrester.*

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one crew build main sewer and another build laterals and make house connections. Later this was changed and the same crew which built the main sewers built the laterals and made the house connections.

Pump Stations. The flatness of topography on the sites and the limiting of sewer depths to approximately twelve feet, determined, within rather narrow limits, the amount of sewage reaching each pump station. This made it possible to work out a standard design for all the pump station structures. Variation in length of force mains from the stations and, to less extent, variation in quantity of sewage made it necessary to vary the size of pumps and motors to fit the several stations.

The ground elevation on the site varied between eight and sixteen feet above sea level and about five feet above ground-water level. For this reason it was considered advisable to keep the pump stations as shallow as possible and provide for fluctuations in flow with additional pumps. Consequently three pumps were provided for each station, one pump to handle normal flow, two to care for peak flows, with the third as a stand-by.

To save floor space, the stations were designed with vertical pumps and extension shafts, with the motors set at ground level. This design was carried out at the stations located in Portsmouth, but the contractor for the Norfolk project stations was unable to get satisfactory delivery on this type of pump. Consequently the design was changed and close-coupled vertical pumps substituted. This called for revision of the ground floor plan of the stations to provide better air circulation to the pump floor. This was accomplished by omitting 3½ feet of floor from each end of the building and providing the necessary guard rail. Changes in the location of float controls and control panels was also necessary.

The Norfolk project design also called for a main pump station to handle the sewage from the two smaller stations, plus about 0.7 million gallons which reach it by gravity, a total of about 2 m.g.d. This main station is similar to the other two stations but slightly larger and is equipped with three 6-inch pumps rather than 4-inch pumps as in the other stations.

The discharge from this station is pumped through 2100 feet of 16-inch force main to the edge of the site, where it is discharged into a City of Norfolk interceptor and carried to a temporary outlet in the Elizabeth river.

There is an area to the south of the present developed area at the Norfolk project which may be developed and would naturally drain toward the project. For this reason the force main from the main pumping station was made larger than it otherwise would have been. When this area is developed and the sewage brought to the pumping station, a change in the impellers of the pumps and possibly the speed of the motors is all that will be necessary in order for the station to handle the greater flow.

Conclusion

In the aggregate, the municipal improvements described in this article have been designed to serve a community of 35,000 population. More than sixty miles of roads (on an 18 foot basis) are under construction. Forty miles of main line sewers and seventy-five miles of house connections have been laid, and more than forty miles of main water line and seventy-five miles of house connections. Originally scheduled for completion in September, 1942, numerous delays have been encountered, and the completion date is now scheduled for early in 1943. In the meantime, however, houses are being tenanted as fast as water, electricity and sewerage facilities can be provided. In order to avoid delays occasioned by lack of off-site outfall sewers (constructed under another Federal Agency), arrangements were made temporarily to pump sewage from the occupied houses to existing sewers in Portsmouth. Pending arrival of certain electrical equipment and materials, temporary connections were made available by the local utility company.

Contracts for the municipal improvements were awarded to several firms. These firms together with the amount of their contracts are as follows:

Hofheimer Construction Company, Norfolk, Virginia $443,453. (Unit Price Contract)

Virginia-Carolina Electrical Works, Inc., Norfolk, Virginia $46,976. (Unit Price Contract)

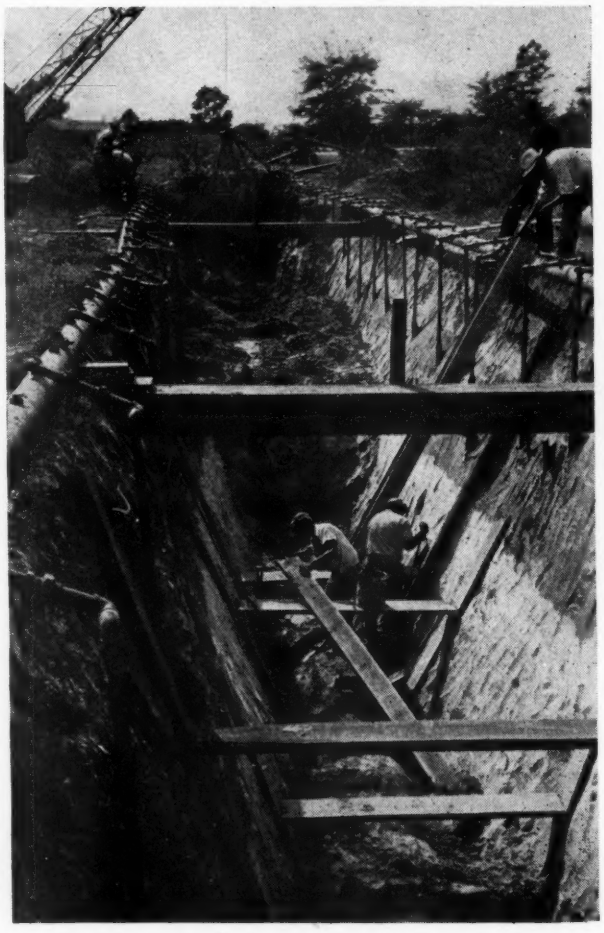
Gannett, Eastman & Fleming, Harrisburg, Pa., $1,750,000. (Fixed-fee contract)

Reiss & Weinsier, Inc., Brooklyn, New York, $2,689,952. (Fixed-fee contract)

Calnaught Contracting Corp., New York, New York $474,047. (Unit Price Contract)

Well-point equipment was furnished by the Moretrench Corp., Griffin Well Point Corp., Complete Machinery Company and John Strang, all of New York. Fairbanks-Morse furnished the pumping equipment for the sewer and water pumps. Cast iron pipe was furnished by Lynchburg Foundry Co.

Harland Bartholomew and Associates were represented in Norfolk by Harry W. Alexander, Project Manager. E. O. Pearson was chief engineer for the firm. R. Stuart Royer, consulting civil engineer of Richmond, Virginia, was associated with the architect-engineers on the design and construction of the site improvements and utilities.



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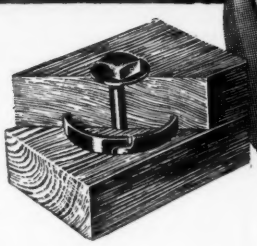

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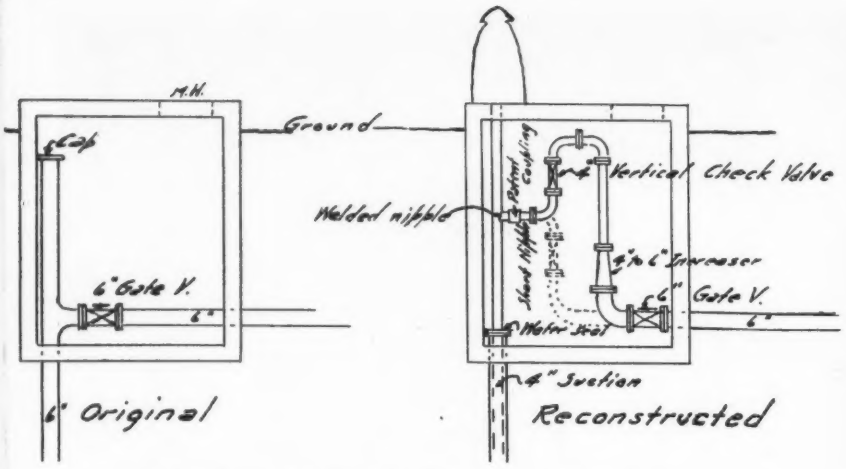
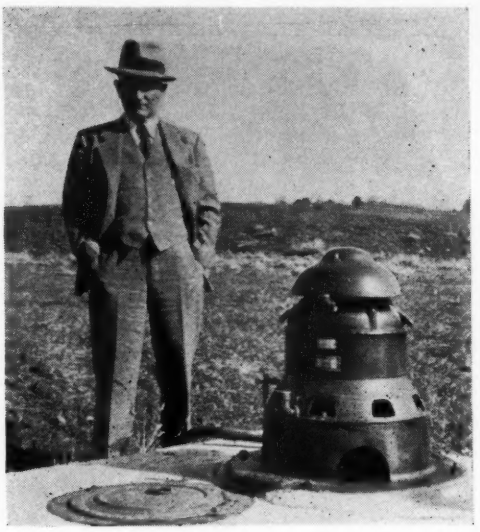


Fig. 4—Change in piping to permit use of deep-well pumps.



L. F. Wertz at Well No. 1.

Changing From Artesian To Deep Well Service

Falling ground-water level necessitated changing from surface to deep-well pumps, which was done without interrupting service.

By L. F. WERTZ
Superintendent, Lebanon, O.

LEBANON, OHIO, a village of approximately 4,000 inhabitants, obtains its water supply from a series of driven wells, all located on a four-acre tract a half-mile west of town.

The first wells were driven at the time of the installation of the water system in 1895. They were artesian wells and flowed into a clearwell, having an overflow into an adjacent creek. For years the only pumps required were those pumping from the clearwell directly into the system and water tower.

In 1931 an iron removal system was added which included an aerator, and to raise the water to the aerator, which was set at an elevation approximately ten feet above the clearwell, two centrifugal pumps, A and B, were installed. When the valves on the two supply lines just outside the clearwell were closed, pump "A" would pump four wells to the aerator and pump "B" would pump five. The uptown pumps X-Y-Z could, by a valve arrangement, be made to pump directly from the wells in addition to the clearwell. This pumping arrangement prevailed until July, 1941.

Fig. 1—The aerator.

It had been known for several years that the Lebanon water level was falling at the rate of about one foot per year and that shortly deep-well pumps would have to be installed; but when the suction pumps in late June, 1941, began to pull a vacuum of 19 to 21 feet, something had to be done immediately. Making it even more urgent was the fact that Lebanon had two canneries and the canning season was almost ready to start, therefore quick action had to be taken to insure an adequate water supply for them. Several pump and well men were immediately contacted and of the number A. D. Cook Company of Lawrenceburg, Indiana, was in position to move on the job at once.

Cook agreed to block off one well at a time, have a test turbine installed and run a capacity test to determine how much water the well would give, and what the drawdown levels would be at different capacities. Then he would withdraw the pumping equipment and treat the well with commercial muriatic acid, using about 125 gallons, develop the well by proper means of surging and agitation, and run an eight-hour pumping test to determine the capacity of the well after development, using the deep-well pump installed for permanent use. This program was followed, the three wells testing as follows:

No. 1—Static level 21 ft.; pumped 233 g.p.m. with 13 ft. drawdown.

No. 3—Static level 18 ft.-10 inches; pumped 237 g.p.m., with 6 ft. drawdown.

No. 6—Static level 21 ft.-8 inches; pumped 229 g.p.m., with 9 ft. drawdown.

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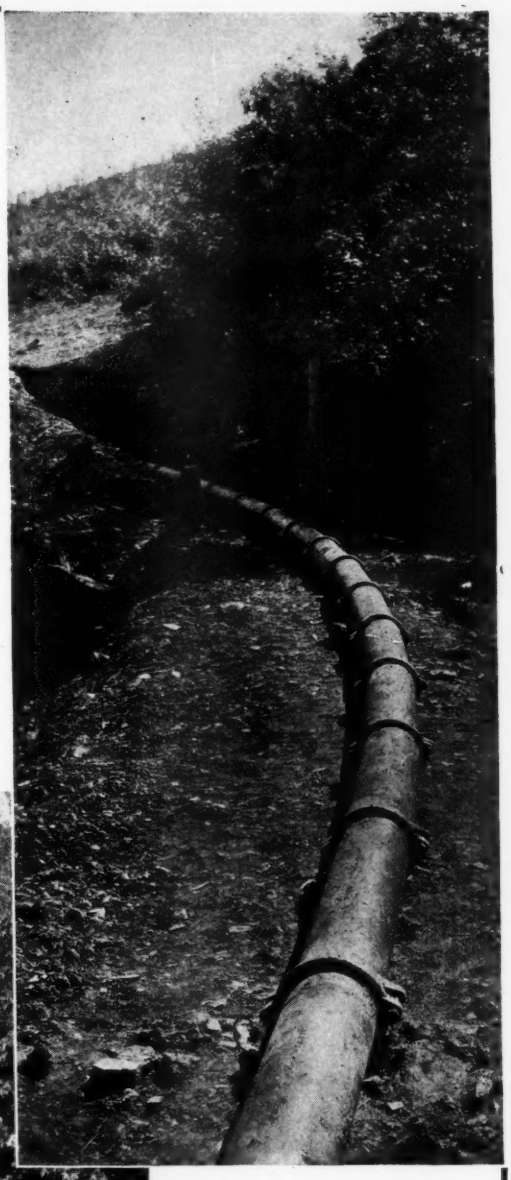

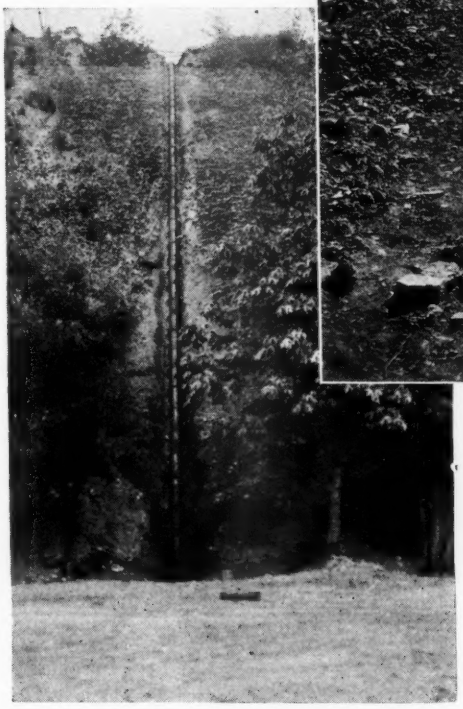

Above *All straight lengths of Universal pipe in this curve.*

At left *16" pipe laid on a 45-degree slope. Note deflection at top to level ground without fittings.*

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Three deep-well turbine pumps were set over wells 1, 3 and 6. These are identical and are made up as follows:

One 6-inch 2-stage Cook turbine pump 6TR-42, 60 feet of 4-inch FCG Column, 1¼-inch shaft tube, 1 1/16-inch line shaft, 10 feet of 4-inch OD suction tube.

One No. 6 UA-4 head with 7½ h.p., 220-volt, 3-phase, 60-cycle, 3450 r.p.m. U. S. motor.

70 feet of ¼-inch OD copper air line and fittings.

One IC-8536 Type SG-2A push button starter.

No. 1 well was developed first, it being the deepest, having a brass strainer and being the farthest removed from suction pump "B." But the gate valve between it and the main line admitted air and consequently pump "B" refused to function, thus compelling pump "A" to furnish all demand from the four-well supply line until well No. 1 could be made ready and a temporary above-ground line run from it to the aerator.

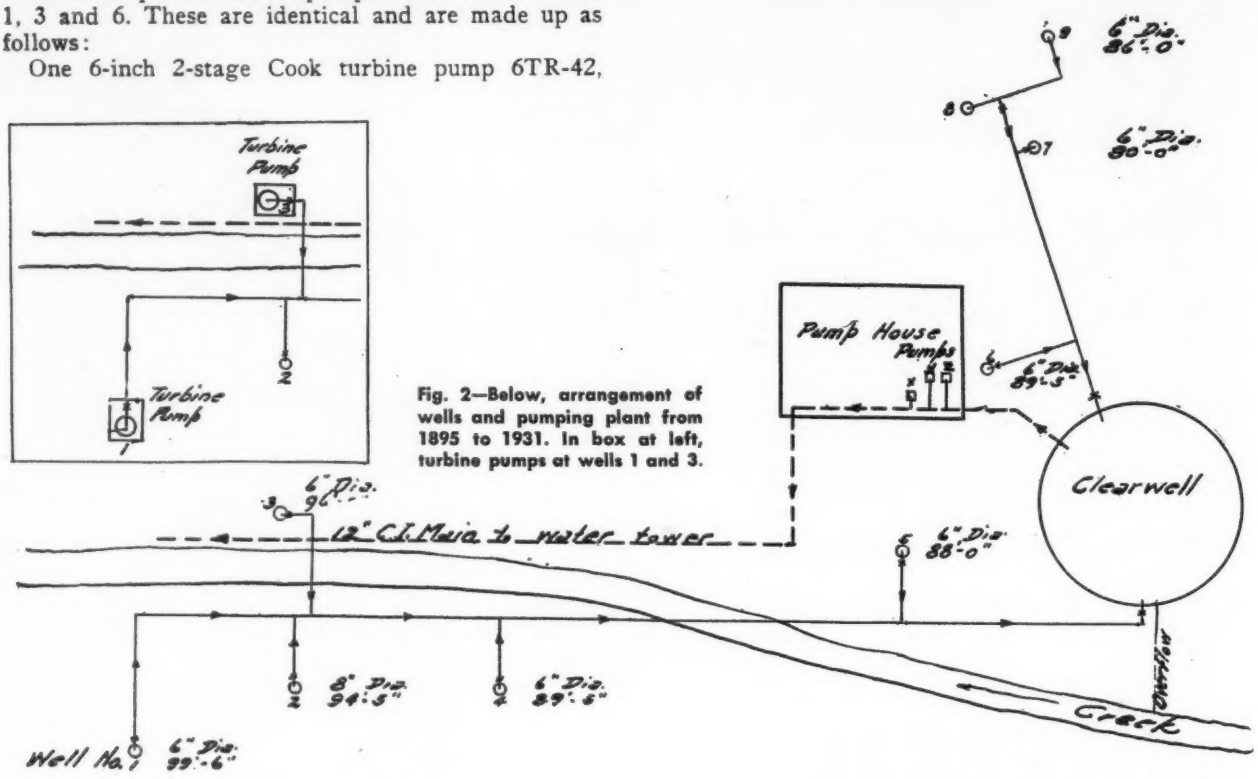


Fig. 2—Below, arrangement of wells and pumping plant from 1895 to 1931. In box at left, turbine pumps at wells 1 and 3.

To change over from centrifugal pumps A and B to the deep-well turbine pumps without interrupting service a series of steps were taken as follows:

(1) Centrifugal pump "A" (on four-well supply line) delivered water to aerator while turbine on well No. 1 on five-well supply line was installed.

(2) After turbine No. 1 had been installed, a temporary line above ground was run from it to the aerator to assist pump "A."

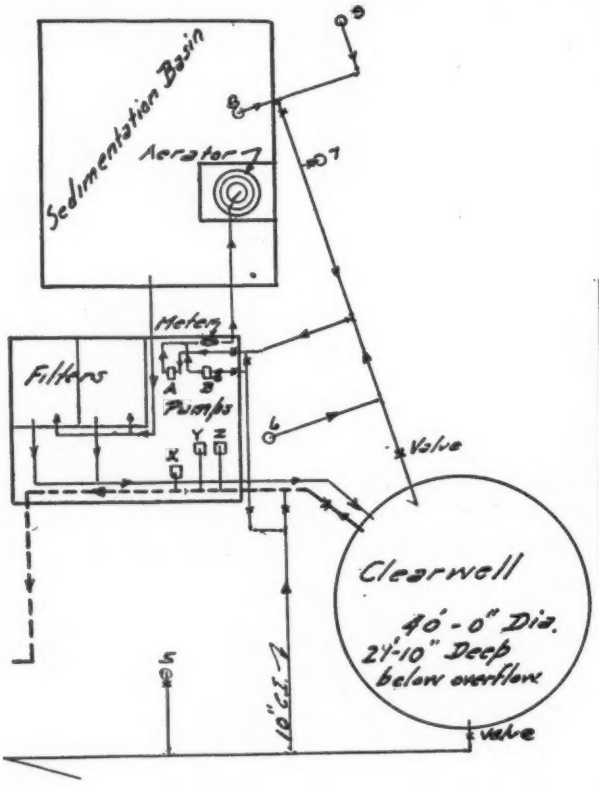
(3) Installed turbine on well No. 3 and connected permanently with underground line.

(4) Installed turbine on well No. 6 with temporary line above ground to the aerator to assist well No. 1.

(5) Pumps A and B removed: made proper pipe connections, and placed turbine on well No. 3 permanently in service.

(6) Connected permanently turbines on wells No. 1 and 6.

The piping arrangement shown in Figure 4 was necessary to keep from changing the manhole. The vertical check valve was first installed as shown by



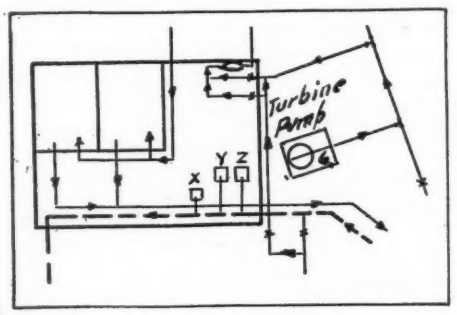


Fig. 3—At left, layout of plant from 1931 to 1941. In box at right, present arrangement at pump house.

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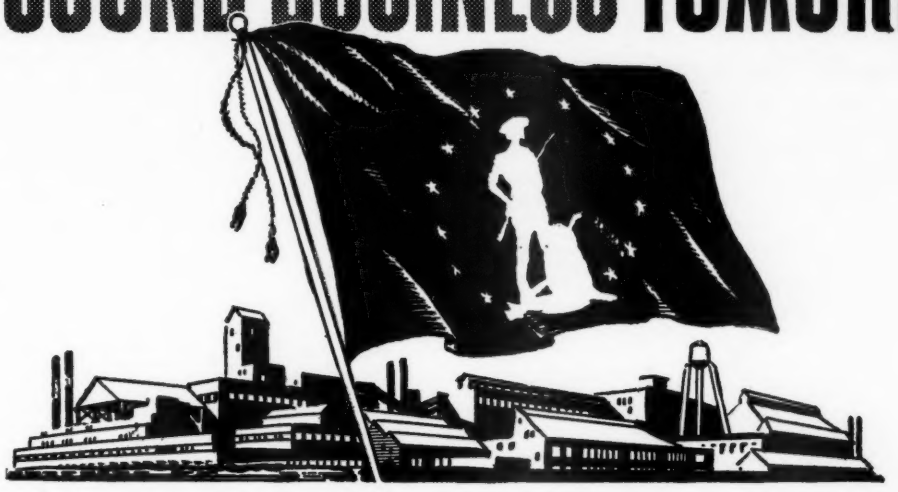

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dotted lines, but, due to too little back pressure, it would not close and had to be changed as shown.

The complete change-over was made between July 7 and August 22, 1941, at a cost of approximately $3600.

Since that time one well normally furnishes about 2/3 the water demand. Two wells are operated about 1/3 of the time, and all wells are alternated day by day. During peak seasons two wells operate simultaneously.

Overcoming the Bloodworm Problem

(Continued from page 12)

which the matter was handled and the trouble eliminated prevented any scare among the consumers and probably never was known by more than a few inhabitants.

The reservoir was allowed to overflow slightly for a few weeks after filling, and was treated twice with copper sulphate at the rate of about three-tenths of a part per million to help prevent re-infection during the remainder of the hot season.

Since open reservoirs are liable to infection during the breeding season of chironomid midges, at which time the eggs are deposited on the surface of the water, it is intended to try to prevent recurrence of this trouble here by constant overflow during subsequent breeding seasons, in addition to copper sulphate treatment. This is a very inexpensive method in a gravity water supply.

Airport Promotion and Planning in Wisconsin

(Continued from page 19)

of 4500 ft. or more in the cardinal directions and diagonals, which will be completed when the transport service demands it.

La Crosse was one of the first cities in Wisconsin to take up aviation, but unfortunately the first airport site selected could not be developed to keep pace with the development of airplanes and interest lagged. But, as in Rock county, an influential group of Air-minded people, ably supported by the daily newspaper, organized a movement for the development of an airport in which substantially every organized group in the city was represented. In a two-page advertisement in the daily paper two days before the bond issue election there were 78 sponsoring groups, including the AFL and CIO, and the $150,000 bond issue was carried by a vote better than two to one. Meantime the State Planning Board, the airport committee and the city engineer's office had been working in cooperation and the airport plans were nearing completion when the bond election was held. The plans call for a minimum length of runway of 6,500 ft., with a possible length of 8700 ft. for one of them.

In selling the idea of airports to cities, although local situations vary in detail there are some similarities. Highway construction is easily promoted because most people own cars. But few as yet own airplanes. Many of even the airminded do not appreciate that, with hundreds of thousands being trained in aviation for the war, with the tremendous facilities for manufacturing airplanes that are being developed, and with the demonstrated ability of aviation to compete with other traffic mediums in transporting certain kinds of freight, airways will be added to railways, highways and seaways as the principal transport mediums. In ten years a city that does not have an adequate airport will be in the same class as one today that is without paved roads.

Many are unwilling to make the start of purchasing a site until they see their way clear to completing the construction. But experience has shown that the cities that possess a suitable site for an airport and plans for building it are the ones that will get priority in Federal aid for airport construction if such aid is extended; and even if it is not, the city will eventually wish to build an airport with its own resources unless it is willing to accept the subordinate commercial position that lack of suitable airport facilities will force upon it.

Wisconsin cities contemplating Class IV airports include Janesville, Clintonville, La Crosse, Marinette, Rhinelander, Sheboygan and Eau Claire—a circle approaching a complete periphery of the State; to which should be added one in the rugged hills of southeastern Wisconsin and at least two others in the extreme north. They should be supplemented by others of lower classifications and a multiplicity of landing fields for private flying.

What is needed to accomplish this result is an active Aeronautics Commission, with the resources necessary to do an adequate job. What the airport planners need to look out for is the securing of the proper sites, and the making of adequate plans that can be carried out by successive stages. In this way nothing will be lost. Too often airports have been started and money spent on sites that were incapable of becoming useful in commercial aviation. With their abandonment, which was inevitable when their inadequacy was realized, there was left a sour taste, which increased the difficulty of subsequent sound airport development.

The first step is to get the right land and enough of it. When that is done, the rest will not be too hard.

Road Building in Nicaragua

General Anastasio Somoza, President of Nicaragua, has developed an extensive road construction program, which includes a road from the northern to the southern boundary, and one from Zelaya on the east coast to the west coast. Work on this first actually was started last summer, with United States engineers in charge, and a dirt road was cut through from Las Banderas to El Rama, more than 1200 miles, and this is now being "converted into a regular highway," to quote a Nicaraguan writer.

Additions to Staffs of WPB Regional Directors

Appointment of twelve assistants on the staffs of WPB Regional Directors who will be assigned to handle the business of the Governmental Division with public officials and public institutions in each area, were announced on November 30. The appointees and the regional offices to which they are assigned are as follows:

Boston, Edward V. Hickey. New York, Donald K. Vanneman. Philadelphia, Thomas H. Healy. Atlanta, Frank G. Etheridge. Cleveland, George Ramsey. Chicago, Arthur C. Meyer. Kansas City, George D. Barnett. Dallas, A. W. Roberts. Denver, Fred W. Roberts. San Francisco, James A. Whiteside. Detroit, P. C. Duborg. Minneapolis, Thomas L. Lambert.

California Project Involves Novel Intersectional Design

(Continued from page 13)

lane, formed by the shelter provided by both the hogback island and the V-shaped directional island. A 450-foot acceleration lane is provided for Powell Street traffic desiring to left turn.

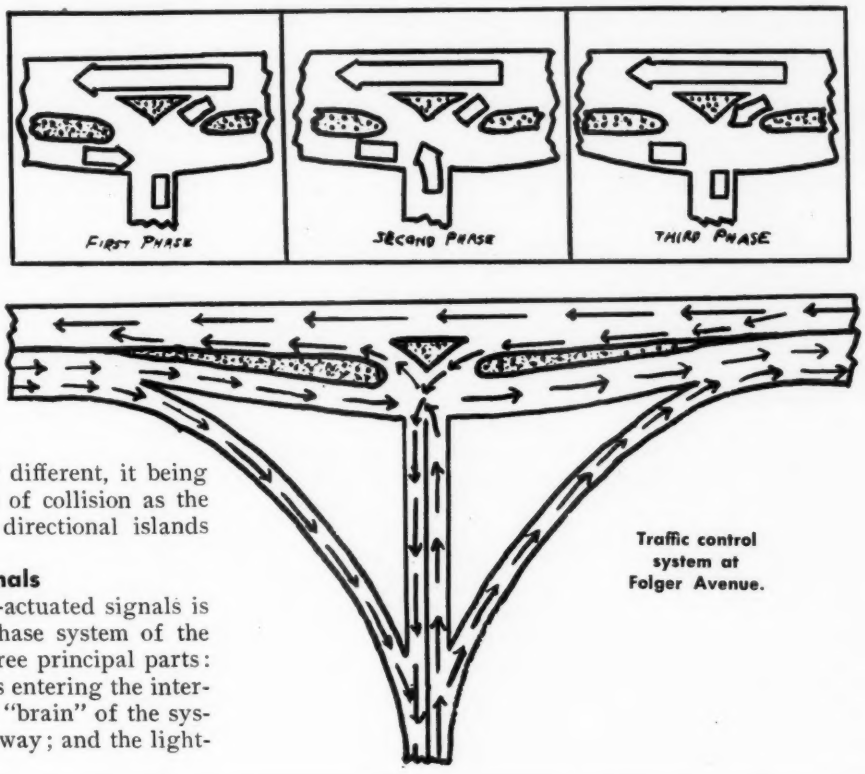
Dimensions are calculated on a basis of allowing traffic to accelerate and decelerate to the normal highway or turning speed, whichever the case may be. The California highway speed limit is 55 miles per hour.

The designs at both Folger and University Avenues are similar, as the sketches indicate. The problem at the Panhandle Boulevard intersection was slightly different, it being desired to limit the possible points of collision as the chief objective. The treatment of directional islands is indicated in the sketch.

Traffic Control Signals

Traffic control through the traffic-actuated signals is particularly interesting. A three-phase system of the type used at Folger Avenue has three principal parts: the detectors, which register vehicles entering the intersection; the controller, which is the "brain" of the system and which assigns the right-of-way; and the lighting units.

Vehicles pass over the detector bar and are registered. Then the controller automatically assigns the right-of-way in accordance with varying traffic demand. This provides a constant adjustment of the time



Traffic control system at Folger Avenue.

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interval for each light, and is particularly desirable inasmuch as it permits continuous use of any busy roadway without lost time waiting for an idle lane to go off the "go" signal. The controller is also arranged so it will skip from any interval to either of the other two if no demand is made on the intervening phase.

Right-of-way is never given to a street in the absence of a traffic demand. Where there is no traffic at all, the "go" signal remains where it was last assigned, unless it has been adjusted for preference to a particular street.

Where the right-of-way is on one street and there occurs a demand on another street, the right-of-way is changed only after a minimum adjustable period has elapsed and after a proper clearance interval has been effected. This occurs as follows:

1. Immediately, if no traffic demand has occurred on the other street.
2. After an adjustable maximum interval, in spite of demand on the other street.

The timing mechanism operates on the static principle, eliminating motor and clock. In any change, it provides for an adjustable initial interval, sufficient to clear stopped cars, in addition to a vehicle interval which operates from each detector impulse. After the initial interval has expired, each impulse cancels the time in effect, and starts a new time period. This feature causes traffic to yield right-of-way when vehicle spacing exceeds a predetermined time.

How this works in practice is shown in the sketch of the installation at Folger Avenue. South-bound traffic is never stopped. (This has a supplementary value in that it tends to send a smooth flow over the Bay Bridge, preventing thick groups of vehicles from collecting at the toll plaza.) In the first phase, northbound vehicles continue through, with both left-turning lanes stopped. The second phase permits Folger Avenue traffic to make its left turn, while the third phase halts all but traffic left-turning from East Shore onto Folger Avenue. There is, of course, no need for traffic control of vehicles on the Y branches leading to and from Folger Avenue. (See Folger Avenue sketch.)

This project was contracted to Lee J. Immel, Berkeley, at $162,512, which included all construction. The traffic control system, it is estimated, will add another $10,000 to the cost.

So, for less than $175,000, a system has been constructed which satisfies a pressing war need. The cost is probably less than one-fifth that of four viaducts, one at each intersection.

Eight Years' Operation of Princeton's Incinerator

(Continued from page 16)

of one of the furnaces eighteen inches, which gave much better results. Inspection of buildings and furnaces indicate very little wear, with the exception of the dome of the furnace and around the doors and the arches leading to the combustion chamber; these as stated before, are repaired each year. After eight years of operation, we have secured all the results that were expected. The fact that no fuel has been used during the period is one of the outstanding accomplishments. There has never been any complaint of odor or smoke from the plant. The annual costs have been well within our estimates and the plant is now over three-fourths paid for.

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based on tort. Galesburg Sanitary District v. American Surety Co., 308 Ill. App. 457, 32 N. E. 2d 407.

Census Data on Water Treatment Plants in the United States

The U. S. Public Health Service in 1939 began a nationwide census of the water treatment plants in continental United States, collecting the data from the sanitary engineering divisions of the various states. The material has now been condensed and mimeographed and arranged in pamphlets by states for general distribution. The plants listed total 5,372 in number, and serve a population of 74,308,000 in places having a resident population of 100 or more. It is hoped to compile and issue annual supplements to the individual state booklets showing new installations and additions to existing plants, and an annual summary, ultimately securing a complete, authentic and up-to-date annual record of community water treatment in the United States.

The tabulations show, for each plant, the population served, plant ownership, sources of supply, date started, rated capacity, output, treatment facilities or practices, laboratory control, and storage capacity.

Summarizing the information given: The population served is about 56% of the total population of the country. Surface supplies are used in 49% of the total number of plants, 46% are from ground sources, and 5% from both; 73% of the population served receive surface water, 19% ground water, and 8% combinations of the two. (All of the figures refer to *treated* water only.) Of the 5,372 treatment plants, 69% are municipally owned, 31% privately. For the 31 states where both population served and total output are known, the average per capita plant output is 119 gpd.

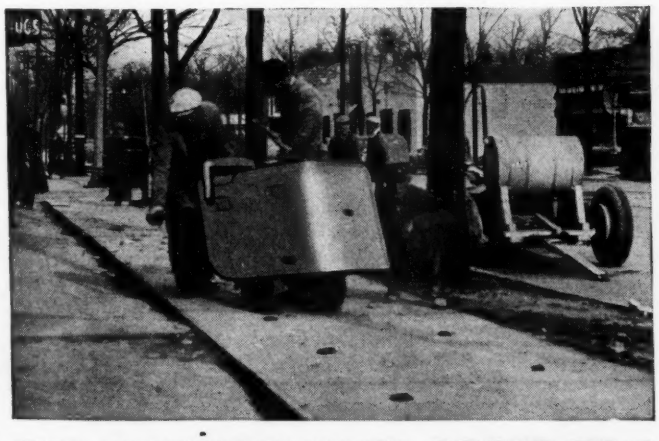
Rapid sand purification only was reported from 30.6% of the plants or 44.0% of the population served; iron and manganese removal from 0.2% of the plants, or 0.5% of the population; softening from 3.6% of the plants, or 8.6% of the population. Slow sand filtration is practiced at 1.7% of the plants serving 8.7% of the population. Plants whose "classified functional use" is iron or manganese removal represent 9.7% of the total; 5.8% where it is softening, and 1.9% where it is both. Simple chlorination and miscellaneous treatment with chlorination were reported for 43.8% of the plants; and miscellaneous treatment without chlorination for 2.7%.

Altogether, 86% of the plants provide chlorination, or 94% of the population receiving treated water. Lime or lime-soda softening is used in 69% of the softening plants and zeolite in 31%; or for 94% and 6% of the population, respectively, indicating the use of zeolite in small installations. The average output for the lime or lime-soda plants is about 1.29 mgd, and about 0.18 mgd for the zeolite plants.

Rapid sand filters were reported at 42% of the total number of plants, of which 82% (where identification was complete) were gravity, and 18% pressure, the latter chiefly in small plants.

Ammoniation is practiced in 13% of all plants, or 15% of those using chlorine. Activated carbon is used in 720 plants, or 14% of the total number.

Plant laboratory control is reported for 1286 plants, of which 47% are chemical control, 5% bacteriological control, and 48% both.



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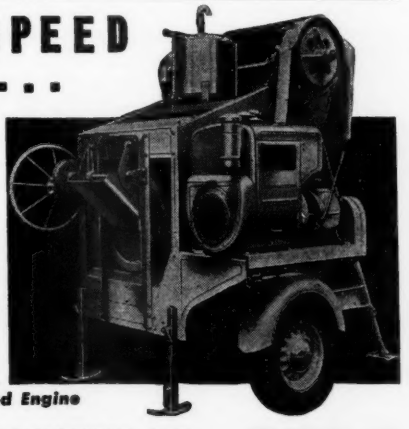

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Sewage Treatment for Public Institutions

(Continued from page 18)

holes, from a plan prepared by us and approved by the State Health Department. (See illustration.)

The approximate cost of the construction was $2,000. It was completed prior to opening of school the latter part of September and it is now functioning satisfactorily.

In institutions even more than in municipal sewerage systems, grease in the sewage presents a difficult problem. It tends to cause stoppages in the sewers and in cesspools, subsurface disposal tile, filters and most other types of treatment. The only practicable remedy seems to be grease traps regularly cleaned. We have found the traps made by the Josam Mfg. Co. satisfactory where properly operated, and cleaned at sufficiently short intervals.

Determination of Percolating Area

In each case, investigation to determine the required percolating area of the cesspools was made in accordance with the standard rules of the New York State Department of Health, which are briefly as follows: In the case of leaching cesspools, a test hole is dug in the bottom of a pit excavated to a depth of about one-half the proposed depth of the cesspool. This test hole is 1 ft. square and about 1 ft. deep. It is filled with water to a depth of 6 in. and the downward rate of percolation or drop of water surface is observed, taking the average time in minutes for the water surface to lower 1 in. in the hole.

To eliminate the effect of a dry soil, the test is repeated and the slower rate of percolation used.

The allowable rate of sewage application per day per square foot of the percolating area of the cesspool is fixed in accordance with the following table:

Time for Water to Fall 1 Inch	*Allowable Rate of Sewage Application per Day per Sq. Ft. of Percolating Area of Cesspool*
1 minute	5.3 gallons
2 minutes	4.3 gallons
5 minutes	3.2 gallons
10 minutes	2.3 gallons
30 minutes	1.1 gallons
60 minutes	0.9 gallons

A test showing a rate of percolation slower than one hour would indicate that this method of disposal is not suitable for such soil.

Highway Signs and Markings for Blackout Conditions

In presenting an article under this heading in our January issue we inadvertently omitted a table showing the relative visibility or effectiveness of the various devices tested to mark the locations of guard rails or culverts. This table is given below. Conclusions from the tests were given in last month's article.

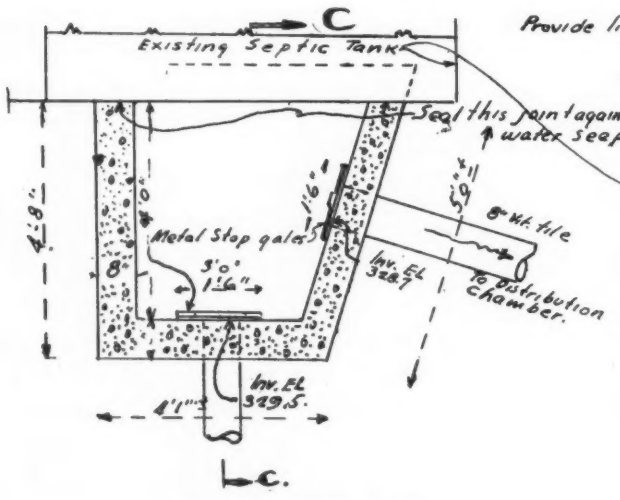
Visibility or effectiveness of various devices to mark location of guardrails or culverts.

Type of device	Sky condition	Number of observations	Distribution of effectiveness and visibility ratings			Rating factor
			Good	Fair	Poor	
			Percent	*Percent*	*Percent*	
Guardrail painted white	Dark	15	27	46	27	50
	Moon	6	25	50	25	50
	Total	21	26	47	27	50
Reflecting buttons on end post of guardrail.	Dark	45	13	60	27	43
	Moon	18	20	40	40	40
	Total	63	15	55	30	43
Reflecting buttons along steel ribbon of guardrail (1 for each 8-foot section).	Dark	30	46	31	23	62
	Moon	12	40	20	40	50
	Total	42	44	28	28	58
Reflecting buttons on steel ribbon and near top of every fourth post.	Dark	15	40	30	30	55
	Moon	6	25	50	25	50
	Total	21	36	36	28	54
White beaded paint on 3 end panels of guardrail.	Dark	15	70	20	10	80
	Moon	6	100	0	0	100
	Total	21	82	12	6	88
Reflecting material (8 inches x 12 inches) on end post.	Dark	30	21	50	29	46
	Moon	12	60	20	20	70
	Total	42	32	42	26	53
Culvert marker with black and white stripes and 3 reflecting buttons at different heights.	Dark	30	23	77	0	62
	Moon	12	25	50	25	50
	Total	42	24	70	6	59

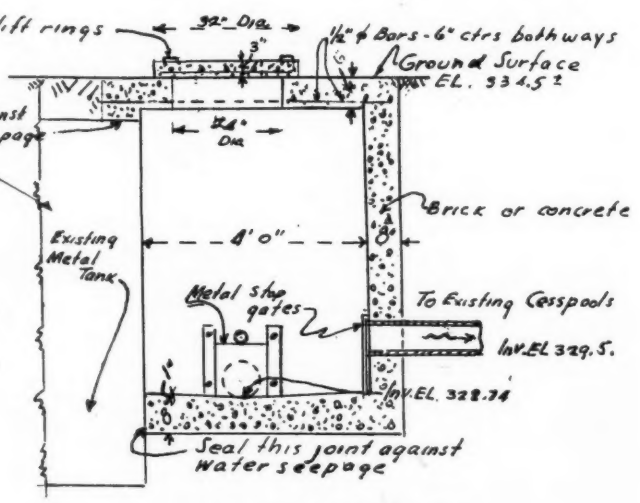
[1] Obtained by adding all of the percentage rated "good" to one-half the percentage rated "fair."

Creosoted Wood Sewer for Acid Wastes

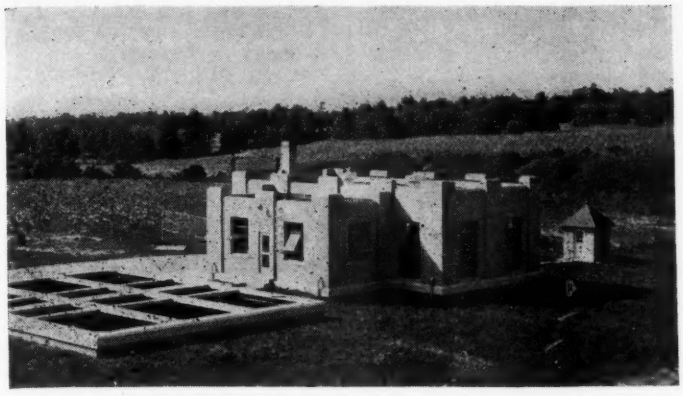
The W. J. Bush Citrus Products Co. of National City, Calif., extracts juices from citrus fruits and oils from the peels. The waste water from the plant, which is high in fruit acids, was for some years discharged into the bay through concrete pipe; but, due to the acidity, the pipe was found to have a service life of only 3 or 4 years. In 1925 the company substituted a rectangular sewer of 2" x 12" lumber, pressure-treated with 8 lb. of creosote per cubic foot. Regrading necessitated removing this sewer in 1942, and the wood was found to be in good condition and capable of further service.



Plan of new outlet chamber.



Section of outlet chamber on C-C.



General view of filter and pumping plant, Oldham County, Kentucky.

The Waterworks Digest

Abstracts of the main features of all important articles dealing with waterworks and water purification that appeared in the previous month's periodicals.

Preparing Valves for Emergency Service

Twelve years ago the only record of the Elgin, Ill., distribution system was a 10 yr. old inaccurate and totally unreliable wall map. A survey was started to locate all mains, valves and fire hydrants. Then valve inspection began—opening and closing each valve, counting number of turns, checking size, leaks, and direction of turning. (Of about 1400 valves, 48 opened to the right, the rest to the left.) Some valve manholes were covered with 2 or 3 ft. of dirt. Most of the stuffing box bolts were rusted and were cut out and painted with a rust preventive; 224 valves were broken; 86 closed; 36 could not be moved. Average cost of inspection and packing these 4" to 20" valves, $1.40 each. A similar inspection two years later (in 1936) cost 43 cts., and in 1938, 21 cts. Inspection at 2 yr. intervals seems desirable, the cost after a 3 yr. interval averaging 29.3 cts. each. Now the 1439 valves are all in good working order, can be closed rapidly and tightly.[A4]*

Test for Break-Point Chlorination

The flash orthotolidine color test must be performed accurately, watched carefully and interpreted properly. The authors developed an orthotolidine solution with only 1-10 ml hydrochloric acid per liter which inhibits all color development until break-point dosages have been slightly exceeded, then turns instantly blue or yellow—blue with a fairly low pH, yellow if above 7.9. It is applicable to pH from 6.2 to 9.5, regardless of chlorine demand.[A8]*

Chlorine Residual and Bacteriological Quality

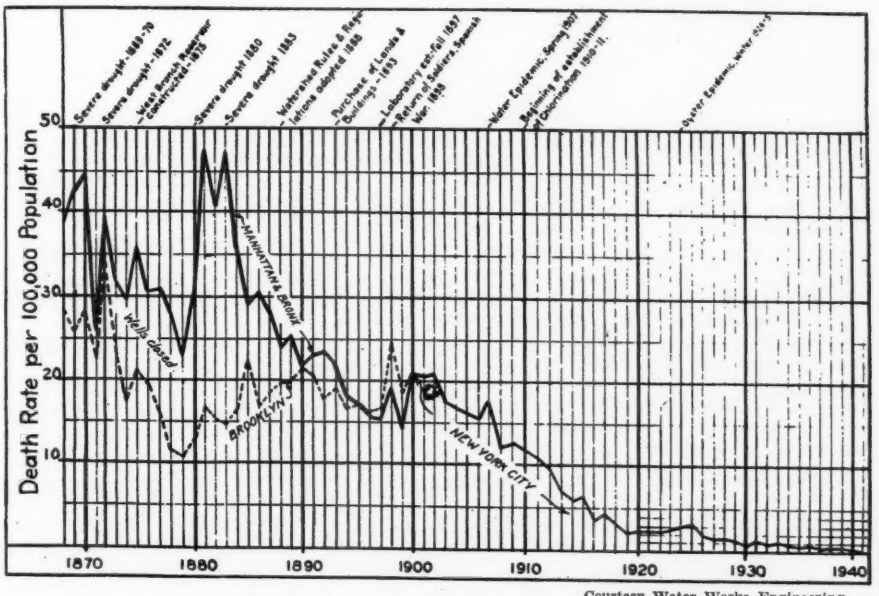
Incidence of more gas formers and coliform bacteria in the mains than at the treatment plant is due to existence of points in the mains where they find conditions favorable for growth. Pseudomonas and Achromobacter (non-pathogenic) survive chlorination and are frequently responsible for aftergrowths.

Various methods of determining chlorine residuals give results differing by 0.2 ppm or more, and reports should name method of determination. In one case non-conforming gas formers were not eliminated by chlorination to residuals of 0.6 to 0.79 ppm in 48 hr. Stipulation of a chlorine residual universally applicable as an index of safety does not seem feasible because of the marked variations in the physical and chemical characteristics of different waters. The bacteriological test in the ultimate criterion of safety. Residuals of 0.3 to 0.4 ppm ahead of, or 0.2 ppm beyond, the break-point for at least 30 min. may be considered a reasonable index of safety, with respect to coliform organisms, for a water discharged into a distribution system.[A9]*

Effect of Water Quality on Typhoid

Between 1868 and 1889 the typhoid death rate of New York City varied from 47.7 to 22.8 per 100,000; from then to 1903, it varied from 23.4 to 14.6. Laboratory analyses and supervision were begun in 1903 and since then the rate has fallen from 17.3 to 0.15 in 1941.

The decrease in recent years cannot be attributed solely or even largely to the water supply, for following nineteen changes in source or treatment of the water supply, only six showed immediate change in typhoid death rate. In fact, except for two epidemics in 1907, it is believed that during the last two decades the water supply has had no connection with typhoid fever; for there has been only an annual fall rise in typhoid rate (returning vacationers, etc.); the cases have occurred chiefly in localized sections of the city; the introduction of chlorination produced no evident effect on the rate, nor did the entire change of source of supply to the Catskill watershed. The factors responsible for the reduction probably include pasteurization of milk, use of anti-typhoid serum, search for carriers, improvement in sewage disposal, fly propaganda, attention to oysters, and the general national decrease in typhoid.[F13]



Courtesy Water Works Engineering

New York's typhoid fever death rate for 1868-1941.

*See Bibliography in the Jan. issue.

Poliomyelitis and Water Purification

Presence of poliomyelitis virus in sewage-polluted waters raises questions concerning the efficacy of water purification in the removal of the virus. Preliminary studies at the University of Michigan indicate that no individual unit of the purification process will remove the virus completely, but that each has some effect. Further, it is revealed that the initial concentration of the virus suspension plays a role in the amount of virus remaining in the water after treatment.[E2]

New Newport News Filtration Plant

The chief novelty of this plant "lies in the fact that, contrary to most plants built in the last few years, it is a compact, effective, utilitarian application of the tried and conventional elements of filter plant design." The buildings are plain but house "protection against accidents to power lines and force mains equalled in few if any comparable plants." All water pipe lines in the plant are cement lined, both the 36" to 4" cast iron and the 3" to ¾" threaded steel. The Venturi meters are unique in that the upstream reducing sections are of cast iron lined with cement. The lighting is generally fluorescent except the external and filter bed vapor-proof lights.[G3]

Waterworks and Sewerage Under One Management

Shreveport, La., has for 56 years operated the two under a single management, and finds this desirable and economical. Less men are required for joint operation. Both have pumping stations, treatment plants, and piping systems in the streets. The records that both should keep are not unlike. The increasingly common practice of basing sewer charges on water consumption is an additional argument. The constructing equipment and personnel are similar for both services.[G5]

Bubbler Detector For War Gases

A gas detector for use by civilian defense volunteers has been adopted by the Los Angeles Citizens' Defense Council, which consists of six 25 x 200 mm filter tubes fitted with one-hole stoppers through which lengths of 4 mm Pyrex glass tubing extend nearly to the bottoms of the tubes. The side arms of these tubes are connected to six outlets on a length of Pyrex tubing which is connected to the aspirator, by which the air to be tested is forced into all the tubes. Six reagents were selected which, taken together, give the most adequate coverage of the war gases most likely to be used. They are: Schroeder's gold chloride reagent, for mustard gas. Sodium iodoplatinate reagent, for mustard gas, Lewisite, ethyldichlorarsine, methyldichlorarsine, brombenzyl cyanide, diphenyl chlorarsine, and diphenyl cyanarsine. Potassium permanganate, for the same gases except brombenzyl cyanide. Methyl orange, the same gases as permanganate plus phosgene and diphosgene and minus diphenyl cyanarsine. Silver nitrate, for the same gases as methyl orange, plus brombenzyl cyanide. Sodium sulfide, for mustard gas, Lewisite, ethyldichlorarsine, methyldichlorarsine, chlorpicrine and chloracetophenone.[G8]

Qualities of Missouri Water Supplies

Public water supplies of Missouri which are analyzed bacteriologically by the State Board of Health also receive one complete chemical analysis each year, this including turbidity, color, odor, total dissolved solids, loss on ignition, alkalinity, total hardness, chlorides, nitrates, sulfates, bicarbonates, carbonates, sodium, potassium, magnesium, calcium, iron, manganese, silica and fluorine.

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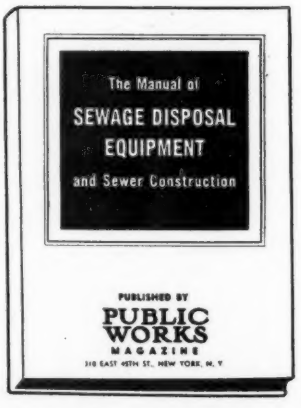

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PUBLIC WORKS Magazine, 310 East 45th St., New York, N. Y.

In 1941 the iron contents of the 133 treated supplies examined varied from a minimum of 0.04 to a maximum of 12.9. The total alkalinities varied from 12 to 480. Analyses of the 153 untreated supplies showed iron contents varying from 0.04 to 8.8, and the total alkalinity from 52 to 755.[Z4*]

Thermometers For Pump Bearings

In the pumping plants of the Kalamazoo, Mich., water works, a two-hand indicating thermometer is provided for each important bearing. One hand is active and indicates the temperature at the moment. The other indicates the maximum temperature that the bearing has reached since the hand was last set, and should the temperature rise to 200°F. it makes an electrical contact that shuts down the pump.[F9]

Eliminating False Presumptive Tests

Elimination by a purification plant of the resistant organisms responsible for false presumptive tests would do away with the work of checking them by a confirmatory procedure, and would increase the margin of safety with respect to the removal of pathogens. This should be possible, with our present knowledge of superchlorination, when adequate chlorine supplies are again available. The examination of five 10 ml portions per sample should be sufficient for the detection of such organisms.[F7]

Auburn's Slow Sand Filters

The water supply of Auburn, N. Y., is purified by four slow sand filters, each 0.395 acre in area, followed by chlorination. From 7 to 8 mgd is filtered. The raw water turbidity is uniformly about 1 ppm. The number of 37° bacteria ranges from 10 to 1,000 per ml, and of 20° from 10 to 10,000. Normally more than 90% of these are removed by the filter. The length of run was originally 90 days, but war conditions have reduced it to 60. Runs can be lengthened profitably in winter by raking between cleanings. After a foot of sand has been removed, all the sand, previously cleaned, is replaced. Cleaning requires 12 to 15 men for 6 hr. Resanding requires about 20 laborers for two weeks.[F8]

Consolidation of Earth-Fill Dams

The U. S. Bureau of Reclamation, when building a rolled earth-fill dam of 1300 ft. crest length, 235 ft. max. height above bed rock and 155 ft. above original stream bed, installed in the embankment 72 piezometers connected to wells 295 ft. downstream from the dam axis. These indicated the pore pressures in the dam. Those 160 ft. below the crest in the cutoff trench showed a maximum pressure of about 35 ft. of water when the embankment was completed. Most of those above the original ground surface reached a maximum pressure of about 5 water feet and then slowly dissipated.

Also apparatus was installed at 5 points for measuring vertical movements of the embankment during and after construction. Four months after the embankment was completed these showed total consolidation with straight-line variation from zero at the top to 3% at 150 ft. depth. Additional long-time consolidation has yet to be determined.[L1]

Inhibiting Corrosion With Hexametaphosphate

A committee of the AWWA recommends adoption, as a standard, of corrosion terminology, recommending the following: *Corrosion,* removal of metal from an exposed surface regardless of its subsequent fate. *Tuberculation* or *incrustation,* encrusting of the removed metal on the pipe as an insoluble oxide or other compound. *Red water,* presence of suspended iron compounds in the water, which

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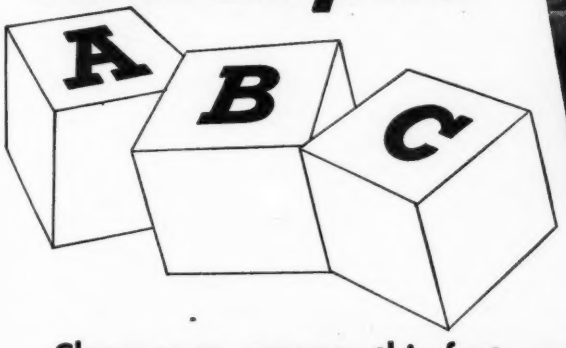

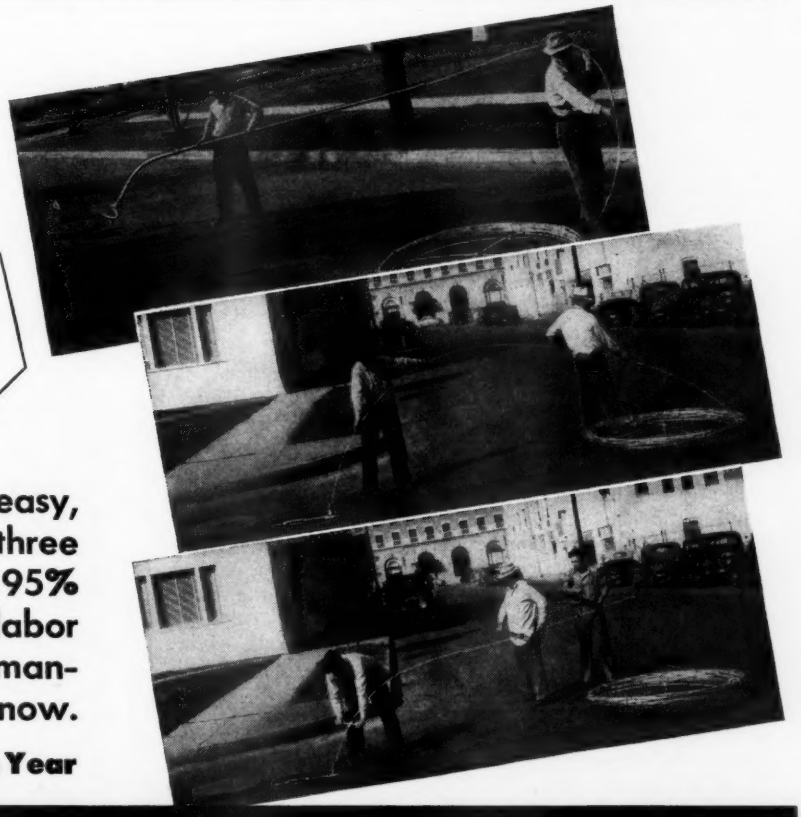

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may be due to corrosion or to the presence of iron in the water itself. *Pitting,* localization of corrosion in small, well-defined areas of penetration.

Concerning use of hexametaphosphate, the committee concludes that:

1. In ferrous metal piping systems, the use of metaphosphates will nearly always eliminate, or at least minimize, the outward manifestations of corrosion, particularly red water and tuberculation.

2. Conflicting evidence as yet forbids a definite statement as to whether metaphosphate does or does not prevent the actual corrosion of ferrous metals, using the term corrosion in the sense of removal of metal from the surface.

3. The effectiveness of metaphosphate in preventing attack on nonferrous metals seems to depend on the metal, and on the particular aspect of corrosion studied. Prevention of precipitates of metal salts and of stains on fixtures seems to be well authenticated. The prevention of penetration and pitting by metaphosphate is at present in doubt in the case of copper, brass and zinc. The action of metaphosphate on lead is to reduce the amount of lead taken up by waters of pH value lower than 7.0, and possibly to increase it slightly in waters of pH value greater than 8.0.

4. Disturbances in water systems produced by the addition of metaphosphate, such as sloughing of scale deposits on pipe and increased bacterial counts, do not seem to be sufficiently common to cause concern, but abrupt changes in pH value should be avoided when metaphosphate treatment is introduced.

5. Metaphosphate has been used to advantage in conjunction with other chemicals commonly used for corrosion control, such as lime, soda ash or caustic soda. Of these, lime is the one generally used. In such combined treatments, the metaphosphate provides an additional benefit by preventing deposition of calcium or magnesium salts in the system, particularly in hot water coils or piping.

6. On the basis of chemical cost only, metaphosphate treatment appears more expensive than most other forms of anti-corrosion treatment; however, when lime treatment and metaphosphate treatment are compared, attention must be given to the cost of the additional soap used by the consumer if lime treatment is adopted. Other benefits secured by metaphosphate treatment, such as the prevention of red water and tuberculation must also be considered.

7. In connection with the action of metaphosphate in preventing red water, it is noted that this chemical may be used to prevent the precipitation of iron and manganese in water.[A11]

Maintenance of Chlorine Residual

Houston, Tex., has 222 dead ends in its distribution system. Tastes and odors in these were caused by organic growths consisting of sheathed, thread-like organisms containing large amounts of ferrous material, which apparently originated in wells that had screen settings in sand strata above 1,000 ft. They were not eliminated by applying 8 lb. of chlorine per mil. gal. at the booster pump. They could be controlled by maintaining a chlorine residual in excess of 1 ppm for over 1 hr., but this developed chlorinous tastes. The solution now employed is to apply 2 to 3 ppm of chlorine at the well, giving 1.3 to 1.7 ppm in the reservoirs; then apply 0.5 to 1.5 lb. per mil, gal. of ammonia at the booster pump, giving 0.3 to 0.8 ppm residuals in the distribution system.

In Wheeling, W. Va., sufficient chlorine is added to the sedimentation basins to give residuals in the mains of ½ to 2½ ppm, and no tastes are noticed unless 2½ is exceeded. To carry residuals of 1 to 2 ppm, add sufficient chlorine to the raw water so that, after 30 min. contact, there remains 32 to 56 lb. per mil. gal., depending on the amount of phenol present; then follow the usual purification process. If taste is noticed, increase the chlorine dose.[A10*]

Bibliography of Waterworks Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. Indicates construction article; *n,* note or short article; *p,* paper before a society (complete or abstract); *t,* technical article.

A — *Journal, American Water Works Ass'n*

January

16. War Emphasis in Waterwork Management. By Samuel B. Morris. Pp. 1-6.
17. Maintenance of Water Supply in Britain Under War Conditions. Pp. 7-18.
18. Can American Water Systems Provide for Civilian Defense? By Kenneth J. Carl. Pp. 19-26.
19. Civilian Defense and Public Water Supply. By Gordon E. McCallum. Pp. 27-29.
20. Maintenance of Public Water Supplies for Civilian Defense. By Daniel W. Evans. Pp. 30-33.
21. Use of the Emergency Alternate Specifications Alum. By Fred E. Stuart. Pp. 34-36.
22. Substitute Materials in the Waterworks Field. By Richard Bennett. Pp. 37-52.
23. Applications of Metallizing in Waterworks Practice. By J. S. Stevens. Pp. 53-57.
24. A Superintendent's Nightmare. By M'Kean Maffitt. Pp. 58-64.
25. Practical Aspects of Guarding Utility Properties. By George A. Hunt. Pp. 65-68.
26. Plans for Emergency Distribution System Repairs in San Francisco. By George W. Pracy. Pp. 69-70.
27. Problems Resulting From Plant Expansion and Minimum Standards for Water Plants in the Southwest. By H. J. Darcey. Pp. 71-72.
28. Wartime Administrative Problems of the Dallas City Water Works. By Homer A. Hunter. Pp. 73-76.
29. Relationship Between Small Town Water Supply and State Health Dept. By Walter A. Reiman. Pp. 77-80.
30. Emergency Experiences During Flash Floods. By Bernard S. Bush and M. J. Barrick. Pp. 81-92.
31. Public Health Service Drinking Water Standards. Pp. 93-104.

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1. Diary on a Deep Well Drilling Job. By Carlton M. Roberts. Pp. 56-58.
2. Polio Virus and Water Purification. By Harve J. Carlson, Gerald M. Ridenour and Charles F. McKhann. Pp. 61-62.

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7. Filter Plant Operation Control by Confirmatory Coliform Tests. By F. R. Georgia. Pp. 1492-1494.
8. Slow Sand Filtration at Auburn, N. Y. By Harold E. Milliken. Pp. 1495-1496.

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9. Automatic Control of Pumps at Kalamazoo, Mich. By Nathan N. Wolpert. Pp. 1542-1548.
10. Automatic Station Control. By Glenn C. Boyer. Pp. 1552-1554.
11. How many Treatment Plants in U. S. Pp. 1555-1556.
12. History of Dubuque, Ia. Water Supply. By Cholm G. Houghton. Pp. 1557-1559, 1573.

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13. Effect of Changes in Water Quality in New York City. By Frank E. Hale. Pp. 12-16.
14. Treating Water at Wichita, Kans. By Charles E. Patrick. Pp. 19-21.
15. *n.* Releasing Air From Pump Lines. By H. A. Harris. P. 30.
16. Operation of Chlorinators During the Winter Season. Pp. 36-37.

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3. The New Filtration Plant of Newport News, Va. by Reeves Newsom. Pp. 502-510.
4. The Maintenance of Elevated Tanks. By John M. Perryman. Pp. 511-514.
5. Do Water Supply and Sewerage Belong Under One Management? By Thos. L. Amiss. Pp. 515-516.
6. *p.* Distribution System Studies. By E. Shaw Cole. Pp. 517-518.
7. *p.* Water Main Cleaning in the War Effort. By Clinton Inglee. Pp. 526-528.
8. Bubbles for Detection of War Gases. By Clifton Bovee. Pp. 529-531.
9. The Flash Test in Control of Break-point Chlorination. By Paul C. Laux and J. B. Nickel. P. 531.

J — *American City*

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3. Water Main Cleaning in Omaha. By J. C. Detweiler. Pp. 41-42.
4. Storage Tank of Timber, Using Wooden Tension Bands. Pp. 70-71.

L — *Civil Engineering*

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2. Measurement of Pore-Water Pressure in Silt and Clay. By Karl Terzaghi. Pp. 33-36.

M — *Water and Sewage*

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1. First Spiractor Installation in America. By Rudolph E. Thompson. Pp. 18-19, 47.
2. *p.* Metallizing as a Method of Waterworks Maintenance. By C. E. Palmer. Pp. 20, 45.
3. Vancouver Agrees to Chlorinate Water Supply. Pp. 24, 31.

P — *Public Works*

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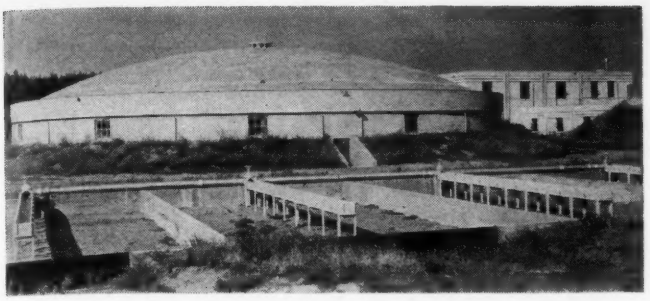
7. Thirty Years' Experience With Deep Well Pumping Equipment. By L. A. Smith. Pp. 14-16.
8. *n.* Maintenance of Pumps. P. 16.
9. Cleaning Mains in a Small City. By M. C. Turner. P. 17.



Brainerd sewage treatment plant. Concrete dome covers filter. Hitchcock & Estabrook, engineers.

The Sewerage Digest

Abstracts of the main features of all important articles dealing with sewerage and sewage treatment that appeared in the previous month's periodicals.

Distillery Waste Treatment by Electrodialysis

The waste experimented with consisted of the residue from the distillation of fermented molasses—"distillery slop." The experiments indicated that it cannot be effectively treated by electrodialysis or by certain standard biological methods without dilution. Electrodialysis alone results in an overall chemical oxygen demand reduction of about 55%. In the cathode compartment it effects coagulation of the colloidal material, and makes the slop more amenable to chemical coagulation, thus saving chemical. It does not reduce the O. C. of the soluble organic matter more than 7 to 10%. Followed by 8 hrs. aeration, a reduction of 90 to 93% in O. C. of the slop was effected, giving a stable residual soluble organic material. It is not economical to continue dialysis treatment beyond coagulation. Treatment of industrial wastes by electrodialysis is most effective when large quantities of colloidal and small amounts of soluble organic materials are present.[C5]

Critical Materials Used in Sewer Maintenance

Based on questionnaires answered by 56 municipalities representing 25% of the U. S. population served by sewage treatment, the following estimate was made of the amounts of various materials used in operation and maintenance of sewer systems and treatment works in 1940.

Sewer Collection Systems: Castings, pipe and other, 37,800,000 lb. Steel and iron, 2,500,000 lb. Rubber products, 387,000 lb.

Sewage Treatment Works: Ferrous metals, 5,700,000 lb. Brass, bronze and copper, 148,000 lb. Lead, 47,500 lb. Aluminum, 36,500. Paints (except aluminum), 40,000 lb. Chlorine, 27,800,000 lb. Fuel oil, 4,900,000 gal. Gasoline, 670,000 gal. Rubber, 139,000 lb.[C11]

Sewer Maintenance In Boston, Mass.

Boston has about 1,250 miles of sanitary sewers, 22,500 catch basins, and 200,000 house connections. The maintenance force consists of 123 men, in charge of a maintenance engineer, 6 inspectors, and 5 emergency crews. Complaints are recorded on a complaint card and telephoned to one of the 4 district yards and attended to by an emergency crew, which reports facts to be used in case of damage claims. In an average year there are about 700 complaints of flooded catch basins, 500 of stopped house connections, 29 of stopped sewers and 6 of broken sewers. Stopped house connections are rodded without charge, but if it is necessary to blow the drain by water pressure, $15 is charged.

During storms, 80 men and 25 trucks patrol the catch basins to furnish immediate relief of basin stoppage. City forces clean about 6,000 basins a year, and 1,200 are cleaned by contract at about $1.25 per cu. yd. The city uses five machines, each of which cleans about 8 basins in a day. A machine costs about $2,000 (not including the truck on which it is mounted) and bucket $350, and the annual overhauling costs about $380.

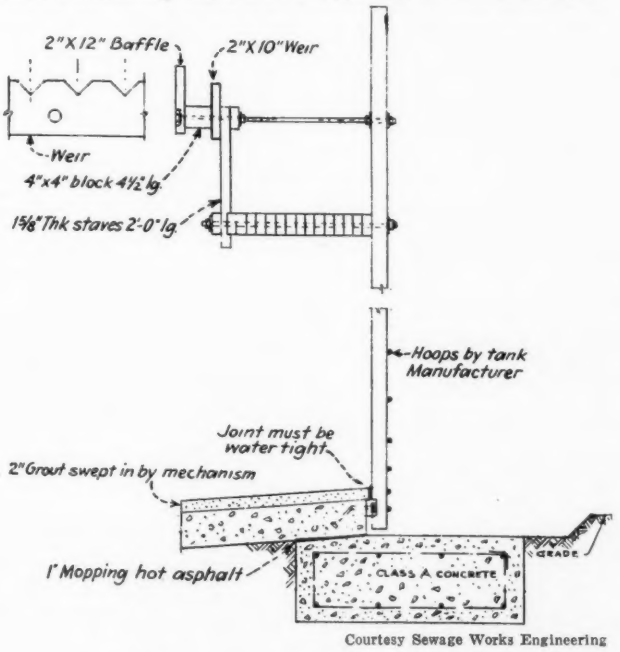
Sewer cleaning is done by either hand winch and bucket or by flexible rod and rubber cup. Flexible rods with augers attached will drill through a sewer filled solid with hard material, or pull back such obstructions as tree roots, planks, etc. For ordinary cleaning, a flexible rod is pushed from one manhole to the next and then a rubber cap with holes around the edge is fastened to the up-stream end, the manhole above it is filled with water, and the cup pulled down the sewer, the water that jets through the holes in the cup loosening the dirt ahead of it. The dirt flushed ahead is caught in the lower manhole by means of a temporary weir and removed by buckets. This method costs about 60 cts. a foot.[C7]

Substitute Materials For Army Camp Plants

In two treatment plants for camps in the southwest, critical materials have been almost entirely eliminated. Wood stave tanks were substituted for reinforced concrete, vitrified clay pipe for iron or steel, and irrigation design practice for details instead of flanged piping details. The wooden tanks are held together with steel hoops, prestressed. The joint between the wood wall and the unreinforced concrete bottom was made by bolting to the concrete a tapered timber that fits accurately the croze of the stave. The scum baffle and overflow trough and weir are built of wood.

At one plant there is only 27 ft. of c.i. pipe in the entire job; vitrified clay pipe laid in a trench filled with concrete was substituted for iron pipe, as pressures were low. Irrigation standpipes were used as surge tanks, eliminating high pressures and permitting use of simple gates instead of gate valves.

The primary digestion tanks are of reinforced concrete, but the secondary tanks are of wood staves. The filter beds



Courtesy Sewage Works Engineering

Details of construction of side of wood stave tank.

have no walls, the filter rock around the circumference sloping at its angle of repose; and except for a few bars in the mechanism support and collection channel, no steel was used in the filter. Wood was used for the bar screens, ventilating ducts and water supply pipe line, and cement-asbestos pipe instead of rubber for carrying the chlorine solution. The whole plant can be knocked down and erected elsewhere, except the concrete floor.[H4]

Experiments on Sludge Compacting

The volume of sludge produced may vary from 2,000 to 7,000 gal. per mg of sewage. The concentration of the sludge is especially important to the operator if digestion capacity or sand bed area is limited, but little information on the subject is available. Experiments on sludges with initial concentrations between 0.5 to 8.0%, and compacted at temperatures of 50° and 68°, led to the conclusions that the character of the sludge, its initial concentration, time and temperature are important factors. Fresh solids compact more rapidly in summer than in winter. During short-time compacting, temperature is not very important. The volume of thin sludge may be reduced by half or more in 6 to 12 hours, depending upon the character and initial concentration of the sludge. Ripe sludge compacts at a higher rate than fresh solids. [H3]

Effect of Heat in Digestion

The Denver, Colo., treatment plant contains two primary digesters and two secondary, all covered. In 1940 the primary tanks were heated to 80°-85°, the secondaries were not heated. In May 1941 they began operating with primary tank temperatures at 90°-95°, the warm sludge from which maintained the secondary tanks at 85°. This caused more violent action and more gas in the primaries; but reduced the gas production for the first 8 hrs. after the raw sludge was introduced. This was found to be clearly due to insufficient mixing, and mechanical mixers were installed and operated twice daily, which kept the gas production relatively constant and increased the output 16%. Later the primaries were seeded from the secondaries by schedule, 2.4% of the amount of one day's raw sludge being used for seeding per week. Also partially digested sludge from the bottom of the primary was mixed with the incoming raw sludge before it entered the digester, which insured immediate starting of digestion. The primaries were loaded at the rate of 4.9 lb. of dry solids per cu. ft. of space. The raw sludge averaged 74.5% volatile; that transferred to the secondaries, 56% volatile; and that from the secondaries, 47%.

The supernatant from the secondaries was poor—about 2% dry solids. Apparently this was due to the introduction of sludge at 95° into a tank of 87° to 90° temperature, causing vertical currents. Heating the secondary tanks resulted in much better supernatant. Also gas pressure in the tanks lessened the escape of gas from the sludge and caused it to float. "By careful observation and proper control the supernatant liquor now averages 0.5% solids instead of the 2% previously experienced."[H6]

Bentonite As a Coagulant

Tests made at the University of Iowa on the use of bentonite as a coagulant, using Iowa City, Iowa, sewage after passing it through coarse screens and a grit chamber, led to the conclusion that "in the most common cases where wastes are in the form of emulsions or colloidal suspensions unpeptized by tannins or other protective colloids, bentonite provides a rapid and effective means for precipitating them and thereby for improving turbidity and B.O.D. conditions of the effluents. Both in the quantity of treating agent required and in the degree of purification effected it compares favorably with the coagulants long used in

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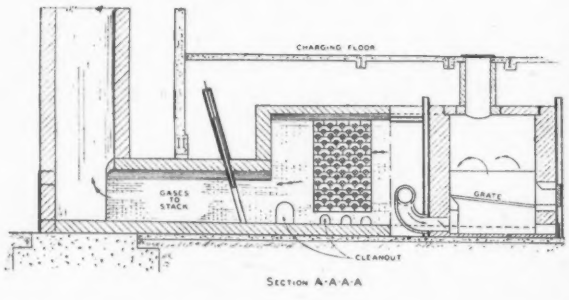

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industrial and sanitary processes. It excels in one particular—marked activity over a wide range of pH values."

Pea canning wastes, which are high in soluble and putrescible organic matter, "belong to a class definitely not amenable to treatment with bentonite or other coagulants except under special conditions, and in the measure they are present in domestic or other sewages their inhibitive effect becomes evident."[G3]

Operation of Army Treatment Plants

The major structures of the army treatment plants are in general as well built as those of municipalities. They include high-capacity filters, Imhoff tanks, sludge digestion, activated sludge, and contact aeration. At most of the new cantonments there was much grit at first, but this has decreased with use and repair of the collection system, although grit chambers still are necessary at some plants. Disintegration of the trickling filter rock in some plants led to the construction of deep grit chambers between the filters and the final tanks, which have proved invaluable.

Grease has given much trouble, but this has been eliminated by a grease trap rehabilitation program and grease salvage, wherever this has been adopted. A clean-out-type flow-control tee is placed ahead of the grease trap; the traps are cleaned regularly when the 50-lb. retention capacity has been reached. Approximately 6,000,000 lb. of grease is salvaged each month, including both interceptor grease and kitchen fats. In a New England plant, grease skimmings fell from 19.8 cu. ft. per m.g. to 1.3 on the introduction of the individual grease trap replacement program.

Some filter trouble has been caused by use of improper stone. In several west coast filters the only part of the stone specifications complied with were those for the size and date of delivery, and the stone disintegrated rapidly.

Above-ground steel digestion tanks lost heat rapidly. The disposal of supernatant is a universal problem; at one southern post a vacuum-type aerator increases the capacity of the digesters and reduces the strength of the supernatant at nominal cost and with little operating difficulty. At four plants the supernatant is drawn off through a slotted well strainer, which remains unclogged only at the point where sludge solids concentration is lowest. The greatest trouble with digesters is due to absence of provision for heating them; even when designed of double the capacity of heated tanks, the operators have little control of them and can not raise temperatures to reduce scum formation. "Blackout" of the flare from waste gas burners is a problem, solved at one plant by placing it in a 24″ chimney with a covered top.

Imhoff tanks in southern Air Corps stations followed by sand filters are giving very good results. Digested sludge drawn from New England Imhoff tanks has a pH below 7, possibly because of low alkalinity of the raw sewage and high grease content.

All but two of the activated sludge plants are operating satisfactorily.

The Army is operating 27 contact aeration plants (Hays process). The smaller plants have good possibilities of producing results equal to high-grade intermediate type of treatment. More air is required than originally planned, the designs can be improved, and possibly some mechanical features (which are very prolific of trouble) can be eliminated. Disappointing results at 11 of the smaller plants are believed due to unbalanced or poor design, mechanical difficulties, inexperience of the operators and lack of control equipment. Only four plants are giving continuous performance in accordance with expectations.

In July 1941 it was evident water consumption and resulting sewage should be reduced. By installing urinal flush valves (instead of continuous flow through perforated pipes), fixing leaky valves, better use of re-

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frigeration cooling water and use of other sources for vehicle and areoplane washing, the average consumption was cut from 94 gpd per capita to 69.4; in one New England plant from 108 to 60.

Data are given for five two-stage biofilters, three single-stage, and four single-stage aerofilters. The single-stage biofilters perform with the expected B.O.D. removal of about 85%, with detention period in clarifiers only half that recommended. All but one of the two-stage biofilters have been overloaded at times, but at the intended loading (5,000 lb. of B.O.D. in the raw sewage per day per acre-foot) give 80 to 90% removal. It may be possible, to save critical materials, to eliminate two-stage plants, using single-stage with dual recirculation. The four aerofilter plants show a wide range in B.O.D. removal, from 60%-83%, averaging about 70% at the design loading. All types of filters show filter fly breeding, controlled by flooding and chlorination; although in New England only a few pass beyond the larva stage before being washed out of the filter.[C2]

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7. Sewer Maintenance in Boston. By Robert P. Shea. Pp. 1314-1326.
8. Sewage Works Priorities: A Symposium. Pp. 1337-1349.

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3. Bentonite as a Coagulant for Sewages and Industrial Wastes. By H. L. Olin, Richard J. Box and R. E. Whitson. Pp. 535-538.
4. *n*. The Waste Gas Burner of Kankakee. P. 541.

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4. "Demountable" Army Camp Plants of Substitute Materials. By Walter Johannesen. Pp. 13-14.
5. Sewage Gas as Engine Fuel Proves Conservation Aid. P. 18.
6. Controlled Heat and Mixing Improve Stage Digestion. By C. P. Gunson. Pp. 20-21.
7. Wartime Problems in Sewage Treatment. By David P. Backmeyer. Pp. 22-24.
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9. Sewage Treatment Plants in U. S. A. Pp. 25-26.

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7. Incinerator and Sewage Plant Operated Jointly. By F. Arthur Cary. Pp. 28-29, 38.
8. *n*. Compensation for Extra Work Under Sewer Construction Contract. P. 45.

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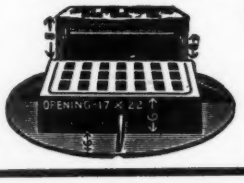

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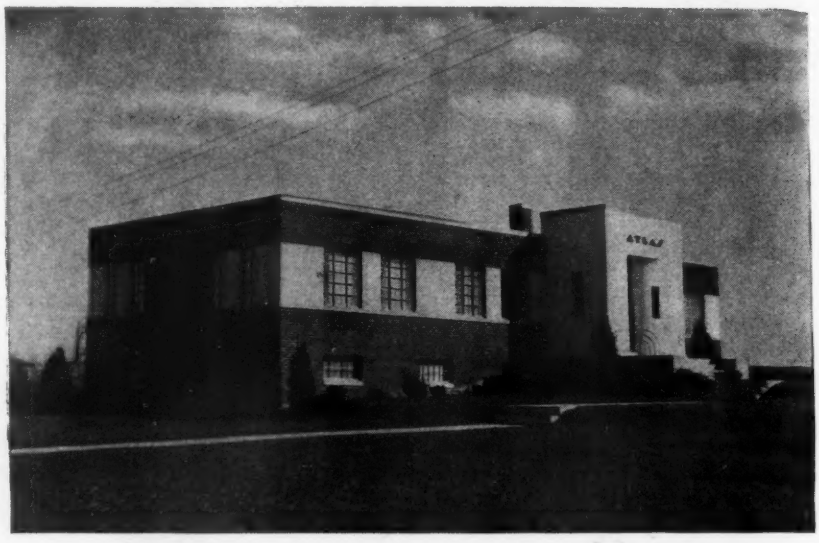


Modern Home of Atlas Mineral Products Co., Mertztown, Pa.

A Modern Administration Building

A name well known in the field of jointing compounds and acid-proof materials is that of The Atlas Mineral Products Company of Mertztown, Pennsylvania, whose modern, air-conditioned administration building is pictured here.

This business was founded in 1892 by the late Max F. Wirtz as a New Jersey Corporation. In 1919 the main office was moved to Mertztown and two years later the New Jersey Corporation was liquidated and reincorporated in Pennsylvania.

In 1915 the firm developed G-K Sewer Compound and began its manufacture. In 1929 it added *Tegul*-MINERALEAD—a sulphur base compound used in making joints in water mains. This compound soon achieved high rank among products for this particular purpose.

In 1930 the Company initiated the manufacture of *Tegul*-VITROBOND, first of a new well-rounded line of acid-proof cements and other corrosion-resistant materials, widely employed in acid-proof units in steel and chemical plants and in other fields.

Joshua Hendy Iron Works Expands

Pomona Pump Company and Crocker-Wheeler Electric Mfg. Co. have been purchased by Joshua Hendy Iron Works, Sunnyvale, California, of which Charles E. Moore is the head and moving spirit. The Crocker-Wheeler plant will be greatly expanded under the management of A. J. M. Baker, formerly Chief Engineer of Willys-Overland and of the Cincninati Milling Machine Company.

George A. McKenna, President, chief owner and guiding genius of the Pomona Pump Co. since 1924, together with the entire executive personnel, has been retained; and in addition to the plants in Pomona, California, and St. Louis, a new 25-acre plant located at Torrance, California, has been purchased and equipped for the manufacture of Pomona Pumps.

Steel Emergency Landing Mats

Irving Subway Grating Co., Long Island City, N. Y.

The new technique consists of laying steel grating mats, each 2 feet by 12½ feet, and filling the meshes with sand. The mats consist of alternate straight and crimped bars.

The only binder necessary to keep the sand confined in the mesh is oil sprinkled on the surface. Walter E. Irving, founder and president of the company, estimates a mile of the surfacing, 25 feet wide, may be laid in 12 hours under normal conditions.

The manufacturers say our fighting forces in all arenas of war have been making use of the steel mats. The gratings make effective roadways even when laid on sandy beach or on farm land, plowed and harrowed. Panels are laid side by side and end to end and attached to each other by slip rings fitting over the tongues of adjacent panels. Implements required are a hammer and a simple pronged tool.

On its own proving grounds, abutting the Long Island City plant, the company says it has effective proof of the permanence of the surfacing.

Fourteen years ago, similar surfacing, filled with sand and sprinkled with oil binder, was laid. With absolutely no maintenance work, loss of sand between the mesh has been practically negligible

Steel grating mats laid on dirt road on proving ground of Irving Subway Grating Co.

and there has been no signs of corrosion. This surfacing was laid over a seldom used dirt road, but subsequently was given hard punishment with trucks and other vehicles.

Mr. Irving believes mat-sand roads will be a foremost post-war development.

Conventions and Association Meetings

February 17-19 . . . Association of Highway Officials of North Atlantic States Annual meeting at Hotel Pennsylvania. It will be a Highway Problems Conference. The committee headed by Hon. Fred. E. Everett, State Highway Commissioner of New Hampshire, has provided an interesting program on problems created by the war including post-war construction and maintenance. *March 25-26* . . . New Jersey Sewage Works Association has scheduled a war conference to be held at the Stacy-Trent Hotel, Trenton, N. J.

Wyandotte Chemicals Corporation Formed

Michigan Alkali Co. and J. B. Ford Co., both established in Wyandotte, Michigan, by Captain John B. Ford, have been consolidated into the above corporation under the same family ownership. Management and personnel will remain the same but the consolidation offers an opportunity for greater service to customers. Bert Cremers is Vice President in Charge of Sales for Michigan Alkali Division.

Handbook for Wartime Care of Centrifugal Pumps

Pumps are being pushed far beyond normal capacities, and many pumps that worked 1800 hours in a peacetime year are now working 8700 hours a year. Consequently, a new standard of pump care is set forth in this new handbook.

Step by step a centrifugal pump is actually built, and as each part is added, the way it's built and functions are shown to determine the way it should be cared for.

Valuable tips included: How a change in liquid can blitz a pump, Easy ways to find leaks, Common mistakes in packin stuffing boxes, How tight is "too tight" for a gland, How to figure head, How to protect pumps against cavitation, The vital role of water as a lubricant in pumps, Quick diagnosis of pump ills, and many others.

This new manual applies to all makes of pumps and contains no advertising. Copies can be obtained free by writing the Allis-Chalmers Mfg. Company, Milwaukee, Wis.

Wellpoints

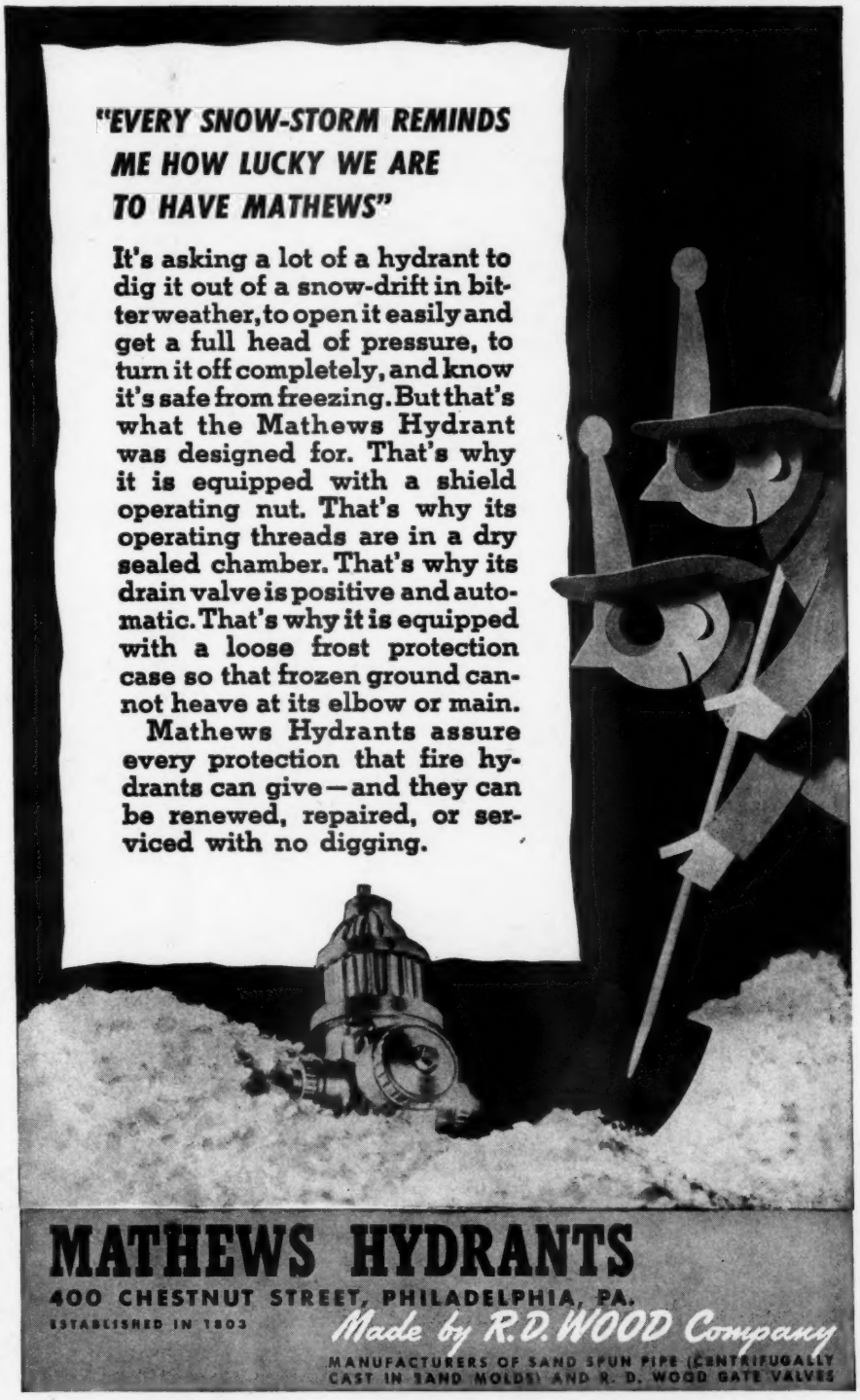
Griffin Wellpoint Corporation
881 East 141 St., New York, N. Y.

In a 60-page catalog this corporation describes its Wellpoints and Jetting Pumps. It includes 145 pictures and drawings illustrating and describing pre-drainage jobs successfully done with Griffin Wellpoints on water works, pipe line, sewage disposal plant, Federal Housing and other Public Works projects. If you have a drainage problem you need a copy of this catalog. Write for it.

Sewage Gas Boosters

Yeomans Bros. Co.,
1409 No. Dayton St., Chicago.

In a 12-page catalog illustrated with numerous drawings and photographs, the gas boosters made by this company for sewage and other gases are fully described. The manufacturers say that the Yeomans gas booster is a recent adaptation of a high-speed, sliding blade air compressor which has been extensively sold for the operation of pneumatic sewage ejectors and other purposes since 1928. It has a capacity range of from 20 to 500 c.f.m. of free gas delivered at discharge pressures up to 50 p.s.i. and all sizes are suitable for direct connection to 1750 r.p.m. drivers.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The advantages claimed for these gas boosters are: no belts, pulleys, gears or valves; quiet running; small space necessary; composition blades; low cost; non-pulsating gas flow; automatic lubrication; light weight; no metal corrosion trouble; explosion proof.

If you are interested in utilizing sewage gas, write for a copy of this bulletin.

Durobar Screens for Electrocuting Flies

Detjen Corporation
303 West 42nd St., New York, N. Y.

The screens are built of high rust-resisting material, substantial and sturdy in construction to insure maximum life under normal operating conditions.

It is claimed that with an electric panel in the door instead of ordinary screen mesh, all flies that approach the door are instantly killed. The manufacturer says that Durobars are in use in the sewage disposal plant at Buffalo, N. Y., and giving thorough satisfaction. Durobar is described and fully illustrated in a folder available upon request.

National Research Council Announces Creation of a Committee on Sanitary Engineering

A sanitary engineering committee has been organized at the request of the Surgeon-General of the Army, by the National Research Council, through the Division of Medical Sciences, acting for the Committee on Medical Research of the Office of Scientific Research and Development. Through liaison officers, advice and assistance in regard to sanitary engineering problems are also furnished to the Navy and the Public Health Service.

In the formation of the Committee, epidemiological and entomological advice was deemed necessary and personnel representing these sciences was included. Close liaison with the Office of The Surgeon General of the Army is maintained through the Sanitary Engineering Branch, Division of Preventive Medicine. The committee consists of:

Abel Wolman, Chairman, professor of Sanitary Engineering, The Johns Hopkins University, Baltimore, Maryland; Kenneth D. Maxcy, Secretary, professor of epidemiology, The School of Hygiene and Public Health, 615 N. Wolfe Street, Baltimore, Maryland; Harold E. Babbitt, professor of sanitary engineering, University of Illinois, Urbana, Illinois; F. C. Bishopp, assistant chief, Bureau of Entomology & Plant Quarantine, U. S. Department of Agriculture, Washington, D. C.; V. M. Ehlers, chief engineer, Texas State Board of Health, Austin, Texas; Gordon M. Fair, professor of sanitary engineering, Harvard University, Cambridge, Massachusetts; H. A. Whittaker, chief engineer, Division of Sanitation, State Department of Health, Minneapolis, Minnesota.

In the several meetings to date, the committee has devoted major efforts to the problem of procurement and training of the large number of sanitary engineering personnel required for essential war activities. In addition to the needs for sanitary engineers as commissioned officers in the Sanitary Corps of the Army, the U. S. Public Health Service and the Corps of Engineers utilize sanitary engineers on a civil service status.

The program covering future activities of the committee includes a continuation of its present work on the availability of and the demand for sanitary engineering personnel; the orderly procurement of and assignment to military, semi-military and civilian agencies of trained sanitary engineers, information on military sanitary engineering problems and their solution; and a consideration of post war needs for sanitary engineers and the fields in which they may be most profitably utilized.

The committee has had strong liaison representation from the War Department, by the presence in the deliberations of Colonels Simmons, Hardenbergh, Prentiss and Robinson; from the Navy, by Admiral Stephenson and Commanders Cushing, Tipton and Burton; from the U. S. Public Health Service by Mr. J. K. Hoskins and from the Selective Service by Major Robert A. Bier. The National Research Council representatives have been Doctors Weed, Davison, Forbes and Colonel Larkey.

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Construction Materials and Equipment

Air Raid Shelters

3. New 8 page booklet pictures and describes a corrugated pipe shelter with gas tight end walls, emergency escape tunnel and other desirable features. Armco Drainage Products Assn., Middletown, Ohio.

Bridges

7. Teco Connectors, a new method of structural engineering, to spread the load on a timber joint more equally over the cross-section of the wood is described in new literature available from Timber Engineering Co., Inc., Dept. BS-2, 1319—18th St., N. W., Washington, D. C.

Cement Dispersion

9. "Economics of Cement Dispersion and Pozzolith" tells the complete story of how cement dispersion reduces water required up to 20% and increases workability 160%. Write The Master Builders Co., Cleveland, Ohio, for a copy.

10. A valuable treatise on available means of securing high strength, prevention of sealing, increased durability and improved wear resistance in concrete pavement construction. Master Builders Co., 7016 Euclid Ave., Cleveland, Ohio.

Cement, Early Strength

11. 64-page manual tells how to speed up year 'round concreting, shows how to secure high early strength and greater workability at temperatures either below or above freezing. Contains many actual examples of practical concreting operations; well illustrated with more than 60 photos, charts, graphs and tables. Calcium Chloride Assn., Penobscot Building, Detroit, Mich.

Cold Mix Plants

15. New catalog and prices of Portable Bituminous Mixers in 6 to 14 ft. sizes for resurfacing and maintenance. Issued by The Jaeger Machine Co., 400 Dublin Ave., Columbus, Ohio.

Concrete Accelerators

31. New 48-page booklet in five sections explains clearly the effects, advantages and methods of using Calcium Chloride and Portland Cement mixes. Complete and packed with practical information; well illustrated; pocket size. Sent free on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

33. 64-page manual of concrete curing with calcium chloride. Complete, handy. Contains useful tables, well illustrated. Write the Columbia Chemical Division, Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa.

Concrete

36. "Cutting Concrete Costs"—Booklet analyzes costs and outlines methods of figuring the lowest cost schedule. Notes on job planning. For copy, write Lone Star Cement Corp., 342 Madison Ave., New York, N. Y.

Concrete Mixers

44. Catalog and prices of Concrete Mixers, both Tilting and Non-Tilt types, from 3½S to 56S sizes. The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

Drainage Products

70. Standard corrugated pipe, perforated pipe and MULTI PLATE pipe and arches — for culverts, sewers, subdrains, cattlepasses and other uses are described in a 48-page catalog entitled "ARMCO Drainage Products," issued by the Armco Drainage Products Association, Middletown, Ohio, and its associated member companies. Ask for Catalog No. 12.

73. "Principles of Design of Airport Drainage" and other articles on airport drainage reprinted from PUBLIC WORKS Magazine are being distributed free by Bowerston Shale Co., Bowerston, O., Hancock Brick & Tile Co., Findlay, O., and Columbus Clay Mfg. Co., Blacklick, O. Address anyone of the above for a copy.

Graders, Patrol

105. The Austin-Western 99M Power Grader with its powerful all wheel drive simplifies all construction and maintenance; handles difficult jobs with economy and efficiency; and does better work on grading, ditching, scarifying, snow plowing, loading, mixing, bulldozing, shoulder trenching and backsloping. Write for Bulletin 1946. Austin-Western Road Machinery Co., Aurora, Ill.

Mud-Jack Method

107. How the Mud Jack Method for raising concrete curb, gutter, walls and street solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities — a new bulletin by Koehring Company, 3026 West Concordia Ave., Milwaukee, Wis.

Oil

109. Ring-Free Motor Oil that keeps motors clean and free from carbon, and reduces frequency of overhauls is described in literature available from Macmillan Petroleum Corp., 530 West 6th St., Los Angeles, Calif.

Paving Materials, Bituminous

111. New "Tarvia Manual" is packed with useful data on how to build and maintain roads with Tarvia. Each step is illustrated with excellent action pictures, 64 pp. 103 ills. Write to The Barrett Div., 40 Rector St., New York, N. Y.

Pumps

120. Interesting new booklet tells how to lengthen the life of your pumps. Explains how a little care will save a lot of wear. Write today for your copy. Homelite Corp., 2403 Riverdale Ave., Portchester, N. Y.

121. New illustrated catalog and prices of Jaeger Sure Prime Pumps, 2" to 10" sizes, 7000 to 220,000 G.P.H. capacities, also Jetting, Caisson, Road Pumps, recently issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

123. New brochure by Gorman-Rupp Co., Mansfield, Ohio, illustrates and describes many of the pumps in their complete line. Covers heavy duty and standard duty self-priming centrifugals, jetting pumps, well point pumps, triplex road pumps and the lightweight pumps.

124. 16-page illustrated bulletin, SP-37, describes and illustrates complete C. H. & E. line of self-priming centrifugal pumps from ½" to 8", including lightweight models for easy portability. C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

Road Building and Maintenance

128. Motor Patrol Graders for road maintenance, road widening and road building, a complete line offering choice of weight, power, final drive and special equipment to exactly fit the job. Action pictures and full details are in catalogs Nos. 253, 254 & 255, issued by Gallon Iron Works & Mfg. Co., Galion, Ohio.

Rock Drill Maintenance

130. New booklet presents through amusing cartoons useful hints on proper rock drill maintenance methods—what your men can do to get more work out of your tools with a minimum of expense for repairs and compressed air. Write The Cleveland Rock Drill Co., 3734 East 78th St., Cleveland, Ohio.

Rollers

133. New Tu-Ton roller of simple construction for use in rolling sidewalks along highways, playgrounds and other types of light rolling is fully described in a bulletin issued by C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

138. "The Buffalo-Springfield line of road rollers (tandem, 3-wheel, and 3-axle) are described in the latest catalog issued by the Buffalo-Springfield Roller Co., Springfield, Ohio."

139. "Ironeroller" 3 Axle Roller for extra smooth surfaces on all bituminous work. Booklet contains roller data and operation details. Hercules Co., Marion, Ohio.

140. This well-illustrated 16-page catalog describes the tandem, autocrat, cadet, and roll-a-plane rollers, and explains what each is intended to accomplish. Write Austin-Western Road Mach. Co., Aurora, Ill.

Rotproofing

145. Cuprinol, a rotproofing chemical that protects wood from fungi and insects, yet has no offensive odor, is non-poisonous, does not corrode metal and can be painted over. Get full details in booklet from Cuprinol, Inc., 7 Water St., Boston, Mass.

Soil Stabilization

150. "High-Service, Low Cost Roads" is one of the newer booklets using an effective combination of picture and text to set forth the principles and advantages of road surface stabilization with calcium chloride. Complete, interesting and well illustrated. 34 pages. Sent by Solvay Sales Corp., 40 Rector St., New York, N. Y.

154. "Soil Stabilization with Tarvia"—An illustrated booklet describing The steps in the stabilization of roadway soil with Tarvia will be mailed on request by The Barrett Div., 40 Rector St., New York, N. Y.

Spreader

187. Jaeger Paving equipment, including Mix-in-Place Roadbuilders, Bituminous Pavers, Concrete Bituminous Finishers, Adjustable Spreaders, Forms, etc.—

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Surface Consolidation and Maintenance

188. Detailed and illustrated presentation of the method and procedure in consolidated operations; explains how sub-soils can be conditioned to resist softening and frost action; how surfacing can be consolidated to provide smooth all-weather riding surfaces; how they can be maintained so as to prevent disintegration and gravel loss. Write the Calcium Chloride Association, Penobscot Bldg., Detroit, Mich., for Bulletin No. 29.

Timber Structures

189. "Typical Designs of Timber Structures" contains plans for 45 representative structures that have been engineered with Teco Connectors. For free copy write Timber Engineering Co., Inc., Room 6GG, 1319—18th St., N. W., Washington, D. C.

Wellpoints

195. New complete catalog, "Griffin Pointed Wellpoint Facts," just issued. Covers pre-drainage, describing wellpoints, jetting pumps, with tables, diagrams, and illustrations. Griffin Wellpoint Corp., 881 E. 141st St., New York.

Street and Paving Maintenance

290. "Blacktop Road Maintenance and Construction Equipment"—Asphalt and tar kettles, flue type kettles, spray attachments with completely submerged pumps, tool heaters, surface heaters, road brooms, portable trail-o-rollers, etc. These are all described in detail and illustrated. This modern and up-to-date equipment for blacktop airport and road construction and maintenance is based upon experience and engineering research over a period of 42 years. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati, O.

Snow Fighting

Snow Plows

350. "Frink One-Way Sno-Plows" is a four page catalog illustrating and describing 5 models of One-Way Blade Type Sno-Plows for motor trucks from 1½ up to 8 tons capacity. Interchangeable with V Sno-Plow. Features, specifications and method of attaching. Carl H. Frink, Mfr., Clayton, 1000 Islands, N. Y.

Ice Control

351. "Make Icy Highways Safe for Traffic"—a new bulletin by Michigan Alkali Div., Wyandotte Chemical Corp., Wyandotte, Mich., tells how to use calcium chloride for modern ice control.

Sanitary Engineering

Aero-Filter

356. "Results Produced by Aero-Filters" is a new pamphlet covering results at Temple, Texas; Paris, Ill.; Webster City, Iowa; and Mason, Mich. Write Lakeside Engineering Corp., 222 West Adams St., Chicago, Ill.

Air Release Valves

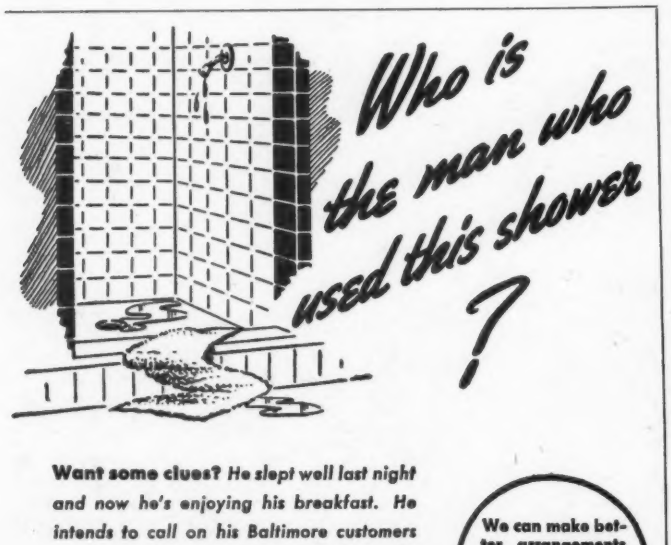
357. Automatic Air Release Valves for water, sewage and industrial uses are described and illustrated in new catalog issued by Simplex Valve & Meter Co., 6750 Upland St., Philadelphia, Pa.

Analysis of Water

360. "Methods of Analyzing Water for Municipal and Industrial Use" is an excellent 94 page booklet with many useful tables and formulas. Sent on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

Activation and Aeration

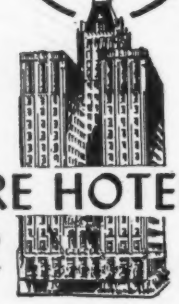
376. A valuable booklet on porous diffuser plates and tubes for sewage treatment plants. Covers permeability, porosity, pore size and pressure loss data, with curves. Also information on installations, with sketches and pictures, specifications, methods of cleaning and studies in permeability. 20 pp. illustrated. Sent on request to Norton Company, Worcester, Mass.



Want some clues? *He slept well last night and now he's enjoying his breakfast. He intends to call on his Baltimore customers today, spend the night here and hop a fast train (45 minutes) to Washington tomorrow morning to tackle some business there.*

Who is he? He could be you on your next trip to this territory—using this famous hotel in this famous city as your convenient headquarters in this busy area.

We can make better arrangements for you if we know you're coming. Reserve your room in advance.



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Blowers

379. All interested in low cost air for sewage disposal will want a copy of this catalog describing operating principles and specifications of Roots-Connersville Aerating Blowers. Write to Roots-Connersville Blower Corp., 301 Valley Ave., Connersville, Ind.

Chlorinators, Portable

380. Complete data on new portable chlorinator designed to meet emergency calls quickly and efficiently. Write Wallace & Tiernan Co., Inc., Newark, N. J.

381. "Emergency Sterilization Equipment," a new bulletin describing the advantages of Dual Drive Chlor-O-Feeders which can serve as either a permanent chemical feeder or as a portable emergency chlorinator. Order from Proportioneers, Inc., 96 Codding St., Providence, R. I.

Cleaning Sewers With Own Forces

383. A 20-page booklet describes and illustrates a full line of sewer cleaning equipment—Rods, Root Cutters, Buckets, Nozzles and Flushers. Write W. H. Stewart (Pioneer Mfr. since 1901), Jacksonville, Fla., or P. O. Box 767, Syracuse, N. Y.

384. 32-page illustrated booklet explains how a city can clean its sewers and culverts with its own forces using the up-to-date Flexible Sewer Rod equipment. Illustrates and describes all necessary equipment. Issued by Flexible Sewer Rod Equipment Co., 9059 Venice Boul., Los Angeles, Calif.

Consulting Engineers

385. "Who, What, Why" outlines briefly the functions of the consulting chemist and chemical engineer. Covers various methods of cooperation, on different types of problems, with industry, with attorneys and with individuals. Foster D. Snell, Inc., 305 Washington St., Brooklyn, N. Y., will send a copy on request.

Feeders, Chlorine, Amonia and Chemical

387. For chlorinating water supplies, sewage plants, swimming pools and feeding practically any chemical used in sanitation treatment of water and sewage. Flow of water controls dosage of chemical; reagent feed is immediately adjustable. Starts and stops automatically. Literature from % Proportioneers, Inc. % 96 Codding St., Providence, R. I.

Fire Hydrants

390. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M & H Valve & Fittings Co., Anniston, Ala.

391. See listing No. 410.

Flow Meters

392. The primary devices for flow measurement—the orifice, the pilot tube, the venturi meter and others—and the application to them of the Simplex meter are described in a useful 24-page booklet (42A). Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.

Gas Holders and Digesters

393. Clarifiers, sludge digesters and other tanks and gas holders for sludge gas. Graver Tank & Mfg. Co., Inc., 332 So. Michigan Ave., Chicago, Ill.

Gates, Valves, Hydrants

394. Gate, flap and check valves; floor stands and fittings. New catalog No. 14 gives detail information with dimensions for all types of new full line. M. & H. Valve & Fittings Co., Anniston, Ala.

395. Complete booklet with much worthwhile water works data describes fully Ludlow hydrants and valves. Sent on request. Ludlow Valve Mfg. Co., Troy, N. Y.

396. See listing No. 410.

Gauges

398. The full line of Simplex gauges for filtration plants are illustrated and described in catalog issued by Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.

Laboratory Equipment

403. pH and Chlorine Control. A discussion of pH control and description of comparators, chlorimeters and similar devices. An 80-page booklet. W. A. Taylor & Co., 7301 York Road, Baltimore, Md.

Maintenance

404. "The Lubriplate Way" contains much valuable information on long-lasting Lubriplate lubricants which are especially adapted for difficult conditions such as parts that are immersed in sewage, water or steam. Write Lubriplate Division of Fiske Brothers Refining Co., 129 Lockwood St., Newark, N. J.

Manhole Covers and Inlets

405. Street, sewer and water castings in various styles, sizes and weights. Manhole covers, water meter covers, adjustable curb inlets, gutter crossing plates, valve and lamphole covers, ventilators, etc. Described in catalog issued by South Bend Foundry Co., Lafayette Boul. and Indiana Ave., South Bend, Ind.

Meters, Venturi

406. New bulletin illustrates Builders Air Relay system of transmission for the Venturi Meter which is particularly useful for liquids containing suspended solids like sewage. Eliminates corroson, clogged pipes, etc. Write Builders-Providence, Inc., Codding St., Providence, R. I.

Pipe, Cast Iron

408. Handbook of Universal Cast Iron Pipe and Fittings, pocket size, 104 pages, illustrated, including 14 pages of useful reference tables and data. Sent by The Central Foundry Co., 386 Fourth Ave., New York, N. Y.

409. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and

pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Burlington, N. J.

410. "Cast Iron Pipe and Fittings" is a well illustrated 44 page catalog giving full specifications for their complete line of Sand Spun Centrifugal Pipe, Fire Hydrants, Gate Valves, Special Castings, etc. Will be sent promptly by R. D. Wood Co., 400 Chestnut St., Philadelphia, Pa.

Pipe, Transite

414. Two new illustrated booklets, "Transite Pressure Pipe" and "Transite Sewer Pipe" deal with methods of cutting costs of installation and maintenance of pipe lines and summarize advantages resulting from use of Transite pipes. Sent promptly by Johns-Manville Corp., 22 East 40th St., New York, N. Y.

Pipe, 2-inch Cast Iron

417. Generously illustrated booklet describes McWane 2-inch cast iron pipe and its manufacture in streamlined pipe shop. Write McWane Cast Iron Pipe Co., Birmingham, Ala.

Pipe Joint Compounds

418. The uses of Tegul-Mineralead for bell and spigot pipe and G-K Sewer joint compound are described in a 16-page illustrated booklet issued by Atlas Mineral Products Co., Mertztown, Pa. Includes useful tables for estimating quantities needed.

Pumps and Well Water Systems

420. Installation views and sectional scenes on Layne Vertical Centrifugal and Vertical Turbine Pumps fully illustrated and including useful engineering data section. Layne Shutter Screens for Gravel Wall Wells. Write for descriptive booklets. Advertising Dept., Layne & Bowler, Inc., Box 186, Hollywood Station, Memphis, Tenn.

Meter Setting and Testing

430. The most complete catalog we have seen on setting and testing equipment for water meters—exquisitely printed and illustrated 48-page booklet you should have a copy of. Ask Ford Meter Box Co., Wabash, Ind.

Screens

434. Be assured of uninterrupted, constant automatic removal of screenings. Folder 1587 tells how. Gives some of the outstanding advantages of "Straightline Bar Screens" (Vertical and Inclined types). Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill.

Sludge Drying and Incineration

440. "Disposal of Municipal Refuse." Complete specifications and description including suggested form of proposal; form of guarantees; statements and approval sheet for comparing bids with diagramatic outline of various plant designs. 48 pages. Address: Morse Boulger Destructor Co., 216-P East 45th St., New York, N. Y.

442. Recuperator tubes made from Silicon Carbide and "Fireclay" Corebusters for maximum efficiency are described and illustrated in bulletin No. 11 issued by Fitch Recuperator Co., Plainfield National Bank Bldg., Plainfield, N. J.

443. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Nichols Engineering and Research Corp., 60 Wall Tower, New York, N. Y.

Softening

444. This folder explains the process of Zeolite water softening and describes and illustrates the full line of equipment for that purpose made by the Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill. Write for a copy of this instructive folder.

Sprinkling Filters

445. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago, Ill.

Swimming Pools

446. Data and complete information on swimming pool filters and recirculation plants; also on water filters and filtration equipment. For data prices, plans, etc., write Roberts Filter Mfg. Co., 640 Columbia Ave., Darby, Pa.

Taste and Odor Control

449. "Taste and Odor Control in Water Purification" is an excellent 92-page, illustrated booklet covering sources of taste and odor pollution in water supplies and outlining the various methods of treatment now in use. Every water works department should have a copy. Write Industrial Chemical Sales Div., 230 Park Ave., New York, N. Y.

450. Technical pub. No. 207 issued by Wallace & Tiernan Co., Inc., Newark, N. J., describes in detail taste and odor control of water with BREAK-POINT Chlorination, a method of discovering the point at which many causes of taste may be removed by chlorination with little or no increase in residual chlorine. Sent free to any operator requesting it.

Treatment

453. "Safe Sanitation for a Nation," an interesting booklet containing thumbnail descriptions of the different pieces of P.F.T. equipment for sewage treatment. Includes photos of various installations and complete list of literature available from this company. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago, Ill.

454. A full line of equipment for sewage disposal including clarifiers, chemical treatment plants, rotary distributors, gas holders and many other pieces of equipment are described in a new bulletin just issued by Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill.

455. New booklet (No. 1642 on Link-Belt Circuline Collectors for Settling Tanks contains excellent pictures; drawings of installations, sanitary engineering data and design details. Link-Belt Company, 2045 W. Hunting Park Ave., Philadelphia.

456. New 16-page illustrated catalog No. 1742 on Straightline Collectors for the efficient, continuous removal of sludge from rectangular tanks at sewerage and water plants. Contains layout drawings, installation pictures, and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia, Pa.

457. New illustrated folder (1942) on Straightline apparatus for the removal and washing of grit and detritus from rectangular grit chambers. Address: Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

458. "Sedimentation with Dorr Clarifiers" is a complete 36-page illustrated catalog with useful design data. Ask The Dorr Company, 570 Lexington Ave., New York, N. Y.

459. A combination mechanical clarifier and mechanical digester, The Dorr Clarigester, is explained and illustrated in a bulletin issued by The Dorr Company, 570 Lexington Ave., New York, N. Y.

461. Prefloccula'ion without chemicals with the Dorrco Clarifloculator in a single structure is the subject of a new booklet issued by The Dorr Company, 570 Lexington Ave., New York, N. Y.

462. Dorrco Monorake for existing rectangular sedimentation tanks, open or closed, is described and illustrated in a new catalog sent on request. The Dorr Co., 570 Lexington Ave., New York, N. Y.

465. Grit Washers and Collectors, by Jeffrey are built in three types: scraper, V-bucket and combination. For full details ask for Jeffrey Catalog No. 703-A. Jeffrey Mfg. Co., 948-99 No. Fourth St., Columbus, Ohio.

466. Flocculation with Floctrols. For details on controlled flocculation, tapered mixing, practical elimination of short circuiting, rapid settling of properly flocculated solds write for Catalog No. 703-A. Jeffrey Mfg. Co., 948-99 No. Fourth St., Columbus, Ohio.

Underdrains, Trickling Filter

468. Illustrated bulletin describes the Natco Unifilter block of glazed, hard burned clay for underdraining filter beds. Write National Fireproofing Corp., Pittsburgh, Pa., for free copy.

Valves (See Gates, Air Release, etc.)

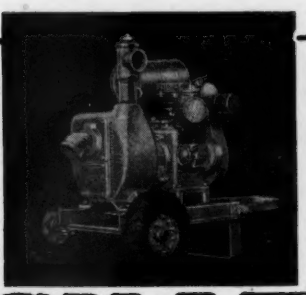
Water Treatment

470. If you have a water conditioning problem of any kind, write Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill., who manufacture all types of conditioning equipment and will be pleased to make recommendations.

472. Bulletin describes stabilizing lime-softened water by recarbonation, discussing gas production, washing, compressing, drying, and applying the CO(2). Infilco, Inc., 325 West 25th Place, Chicago, Ill.

Water Service Devices

500. Data on anti-freeze outdoor drinking fountains, hydrants, street washers, etc., will be sent promptly on request to Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati, Ohio.



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NEW APPOINTMENTS

New City and County Officials recently reported:

City Engineers

L. Cedric Macabee, Los Gatos, Calif.
O. L. Hill, Bedford, Ind.
W. C. Worthy, Jackson, La.
James Deneen, Crookston, Minn.
Louis G. Goodell (Acting), Lorain, Ohio.
Walter Stegman, Wheeling, W. Va.

City Managers

Robert W. Mead, Redwood City, Calif.
L. E. Smith, Morganton, N. C.
P. I. Austin, Terrell, Tex.

Public Works Superintendent

A. M. Whittemore, Keene, N. H.

Water Works Superintendents

J. H. Hamilton, Talladega, Ala.
C. H. Bryson, Colorado Springs, Colo.
Chas. Jautzen, Jacksonville, Ill.
Emery Giard, Joliet, Ill.
Robert B. Lee, Bedford, Ind.
W. J. Edwards, Cumberland, Md.
Chester E. Bradley, Swampscott, Mass.
George Schlitt, Superior, Nebr.
Robert M. Gordon, Goffstown, N. H.
Harry T. Campion, Defiance, Ohio.
P. H. Dowell, Milton, Pa.
J. A. Angove, Oil City, Pa.
L. J. Townsend, Brady, Tex.

County Engineers

J. M. Holt, Limestone Co., Athens, Ala.
Jno. B. Sockwell, Colbert Co., Tuscumbia, Ala.
R. L. Stump, Ventura Co., Ventura, Calif.
Erb Hanson, Fayette Co., Connersville, Ind.
Adolph Weitzel, Gibson Co., Princeton, Ind.
Milton Drake, Sullivan Co., Sullivan, Ind.
O. K. Brewer, Page Co., Clarinda, Iowa.
John F. Berry, Tama Co., Toledo, Iowa.
J. R. Streeter, Neosho Co., Erie, Kan.
John Reagan, Bourbon Co., Fort Scott, Kan.
W. T. Niggemann, Crawford Co., Girard, Kan.
Vernon Huntington, Graham Co., Hill City, Kan.
Vernon E. Day, Sheridan Co., Hoxie, Kan.
Thomas B. Quinn, Hodgeman Co., Jetmore, Kan.
L. C. Rhoades, Norton Co., Norton, Kan.
T. C. Cory, Labette Co., Oswego, Kan.
R. H. Lister, Miami Co., Paola, Kan.
Robert H. Major, Wallace Co., Sharon Springs, Kan.
Glenn C. Mountjoy, Cheboygan Co., Cheboygan, Mich.
Ed. E. Ferris, Ingham Co., Mason, Mich.
Ken. K. Goeltz, St. Clair Co., Port Huron, Mich.
J. E. Herzog, Steele Co., Owatonna, Minn.
T. Day, Hubbard Co., Park Rapids, Minn.
L. Schurhammer, Jr., Wabasha Co., Wabasha, Minn.
J. J. Sumerall, Marion Co., Foxworth, Miss.
R. J. Femmer, Montgomery Co., Montgomery, Mo.
Edward S. Disbrow, Hunterdon Co., Flemington, N. J.
William H. Baum, Gloucester Co., Woodbury, N. J.
Lester J. Collson, Chemung Co., Elmira, N. Y.
W. Bruce Chilson, Chautauqua Co., Falconer, N. Y.
C. H. Edmunds, Cattaraugus Co., Little Valley, N. Y.
Fred C. Line, Monroe Co. (Acting), Rochester, N. Y.
J. A. Kaestner, Jr., Albany Co., Voorheesville, N. Y.
A. L. McFarland, Ross Co., Chillicothe, Ohio.
Claude F. Skidmore, Union Co., Marysville, Ohio.
W. R. Canton, Klamath Co., Klamath Falls, Ore.
H. F. Martley, Spink Co., Redfield, S. D.
C. A. Koehler, Jefferson Co., Beaumont, Tex.
Harold H. Herzog, Kenosha Co., Kenosha, Wis.
L. H. Dillinberg, Shawano Co., Shawano, Wis.

New Publications of the Asphalt Institute:

"Asphalt Construction in Cold Weather" *Specification MP-2, "Modified Penetration Cut-Back Asphalt Surface Course"*

In its newly issued publication, "Asphalt Construction in Cold Weather," The Asphalt Institute recommends construction procedure to be followed when using Hot-Laid Asphaltic Mixtures in freezing weather.

Another publication of the Institute, just issued, is its newly adopted Construction Specification MP-2, "Modified Penetration Cut-Back Asphalt Surface Course."

Both of the foregoing publications are available without charge upon request to The Asphalt Institute, 801 Second Avenue, New York, N. Y.

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